29 JUNE 1961

ONE SHILLING AND SIXPENCE

ELECTRICAL TIMES

BICC

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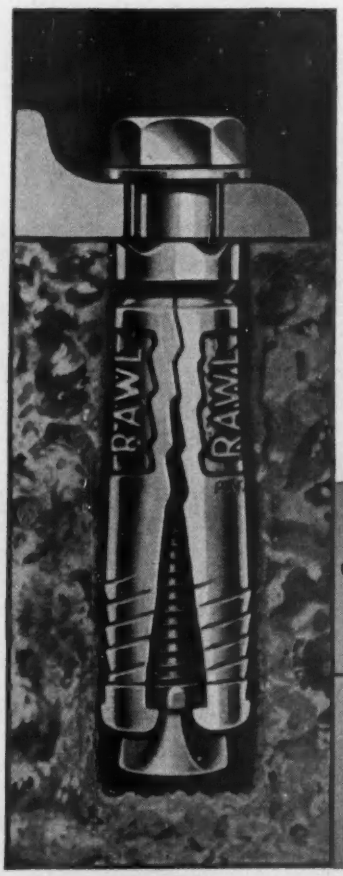

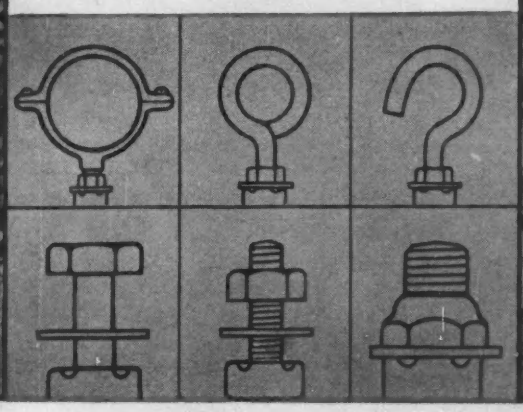

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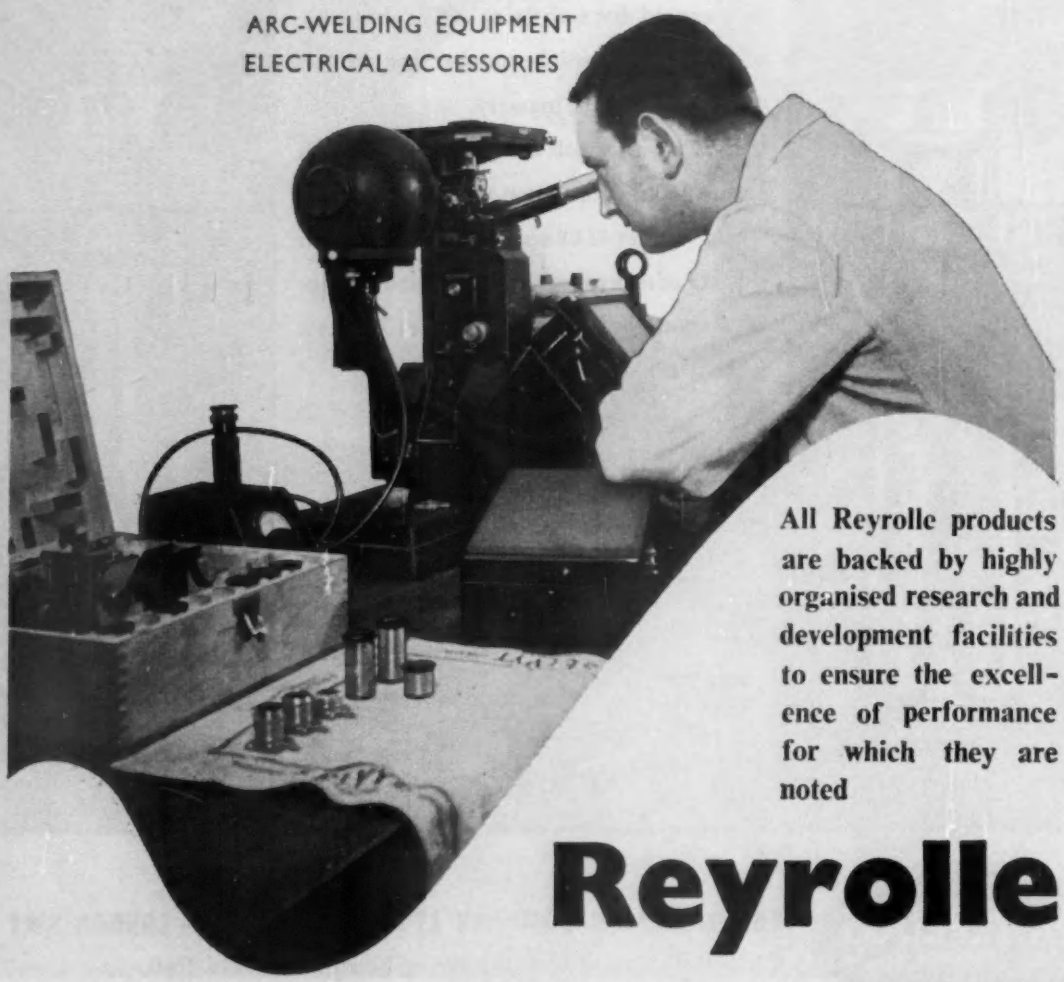

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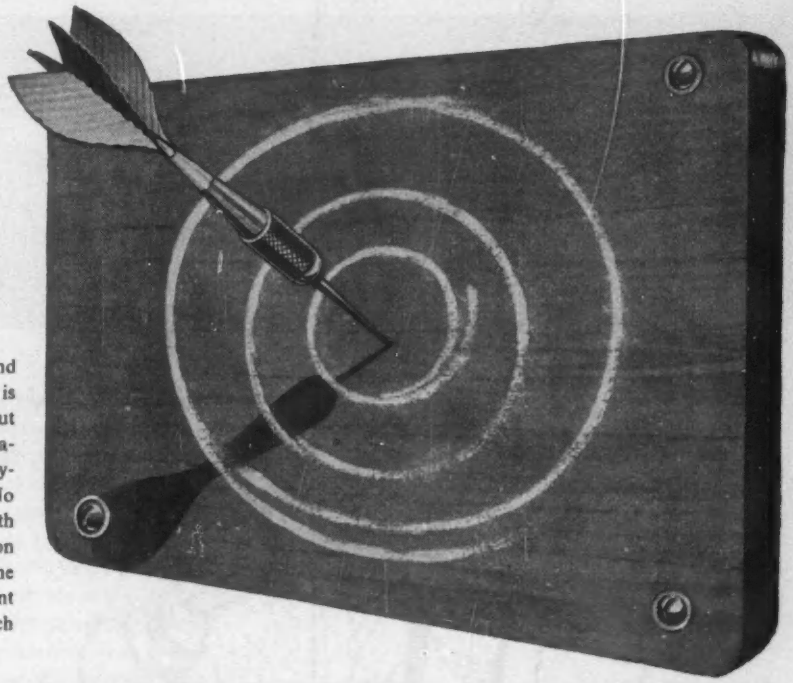

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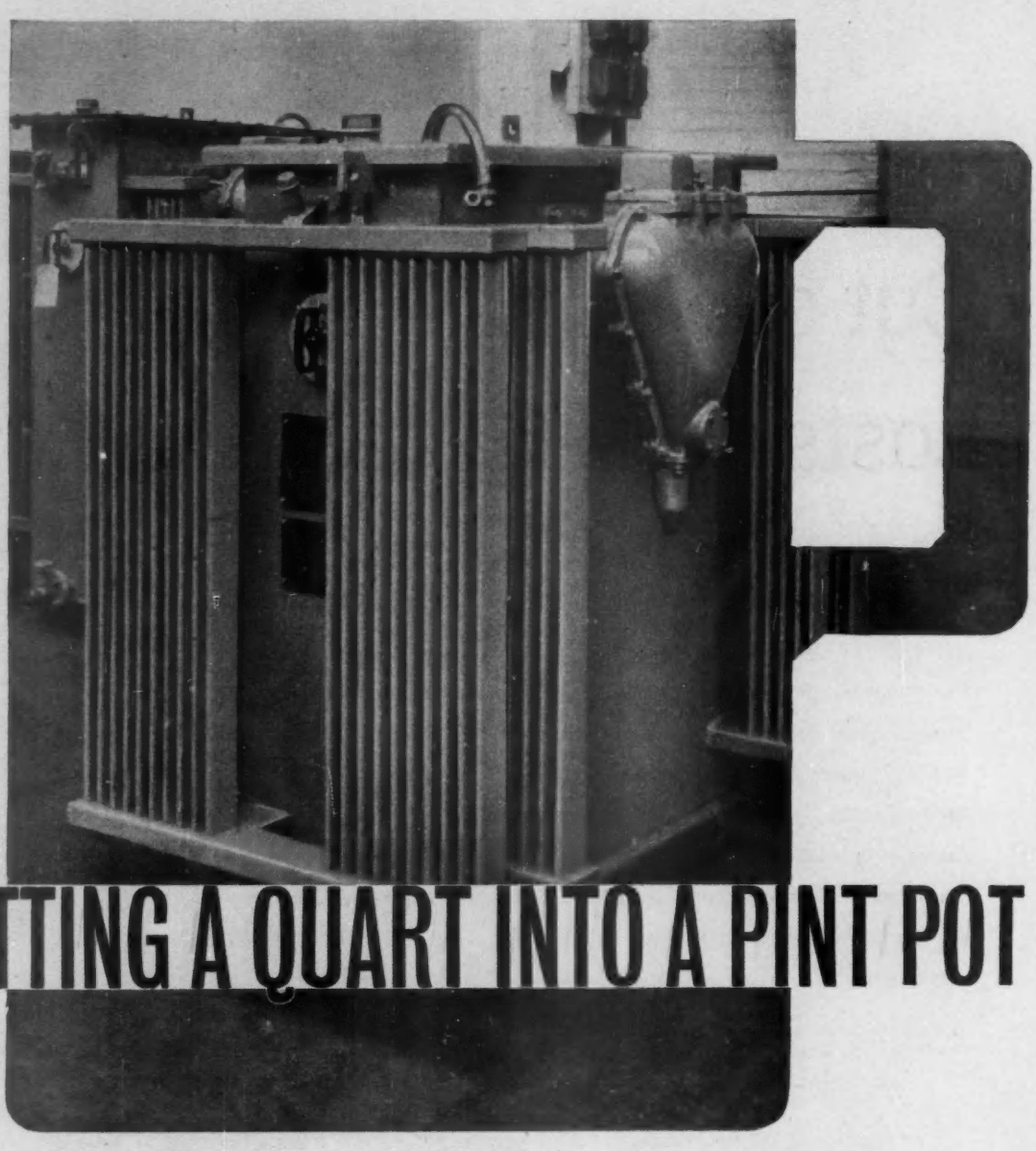

GETTING A QUART INTO A PINT POT

The compactness of the present range of Brush T.1. Distribution Transformers will be particularly appreciated by authorities who find it necessary to increase output of their existing transformer sub-stations to meet increasing demands for power, without carrying out major alterations to buildings. A modern Brush 500 kVA transformer can be placed in a sub-station building originally designed for a 300 kVA transformer, with room to spare for housing the larger associated switchgear. Besides being extremely compact this new series of T.1. Transformers greatly reduce noise level.

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NEWS SHEET

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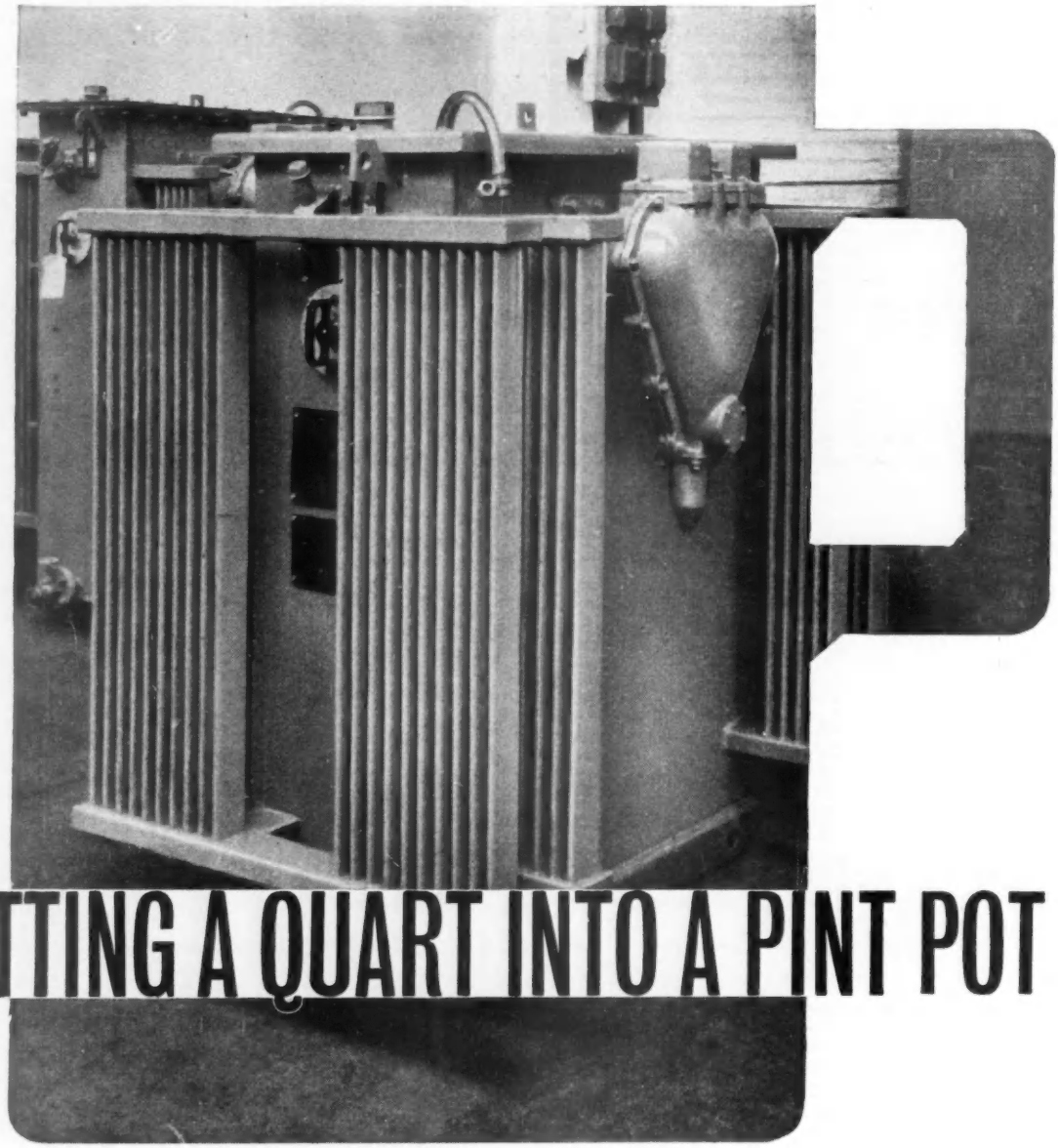

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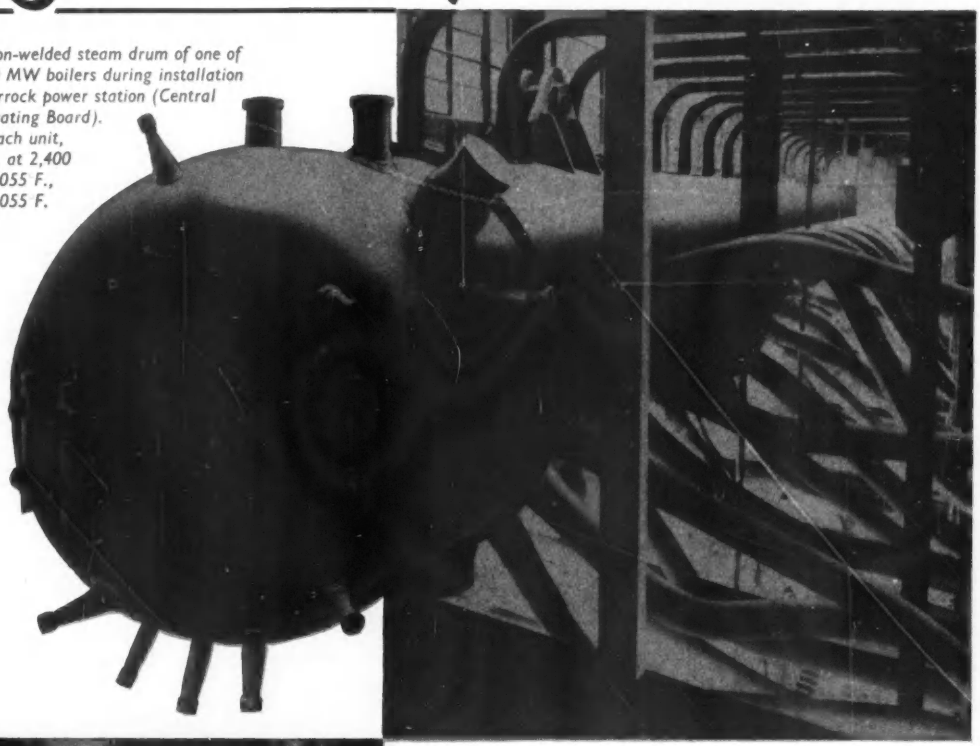
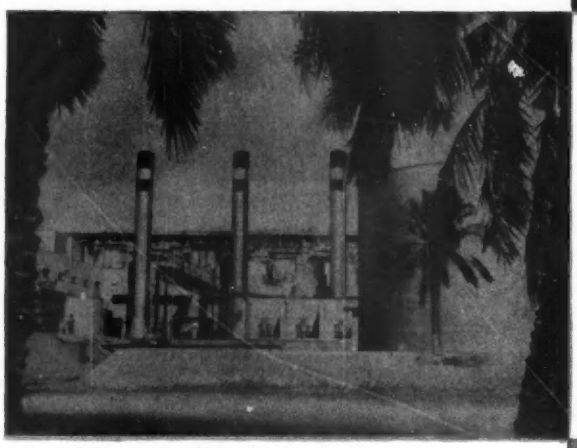
Meeting World-wide power demands



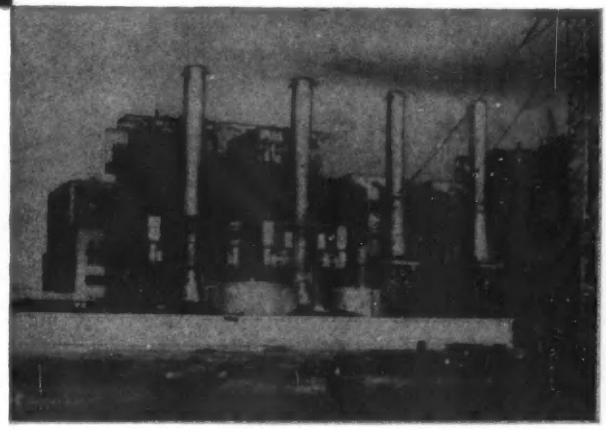
The 155-ton fusion-welded steam drum of one of two Babcock 200 MW boilers during installation at the West Thurrock power station (Central Electricity Generating Board). Evaporation of each unit, 1,350,000 lb./hr. at 2,400 lb./sq. in. and 1,055 F., with reheat to 1,055 F.



STEAM is, by far, the world's most important medium for electrical-power generation and a very high proportion of the world's power stations is equipped with BABCOCK steam-raising plant.
Recent contracts for home and overseas central station boilers include units of 200, 300, and 550 MW capacity, a number to operate on a reheat cycle, and a 375 MW boiler of the "once-through" type to generate steam at super-critical pressure—3650 lb./sq. in. and 1110°F. with reheat to 1055°F.

(Above) Power station at Basra, Republic of Iraq, equipped with three 165,000 lb./hr. BABCOCK Type FH Integral-Furnace, oil and natural-gas fired boilers. (Consulting Engineers : Ewbank & Partners).

(Right) VENEZUELA. Babcock boilers at the Tacoa power station of La Electricidad de Caracas, including units of 550,000 lb./hr. capacity, fired by oil and natural gas. (Consulting Engineers : Sofina).



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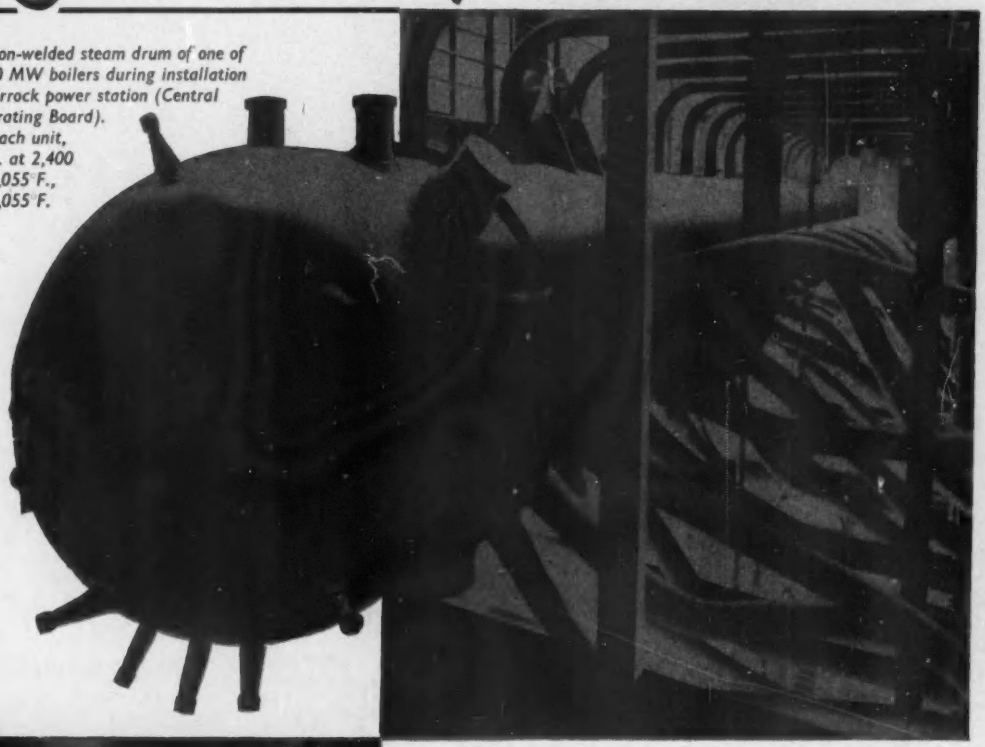

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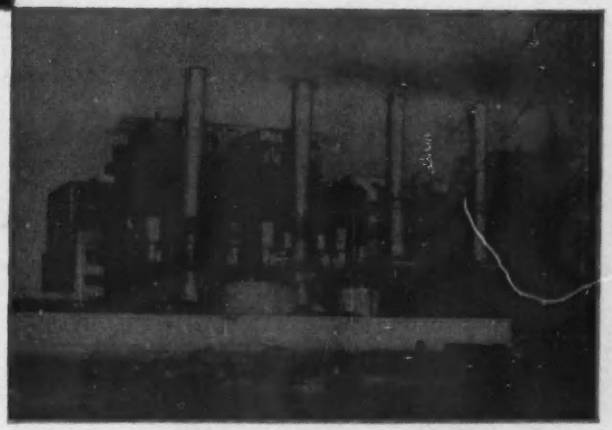

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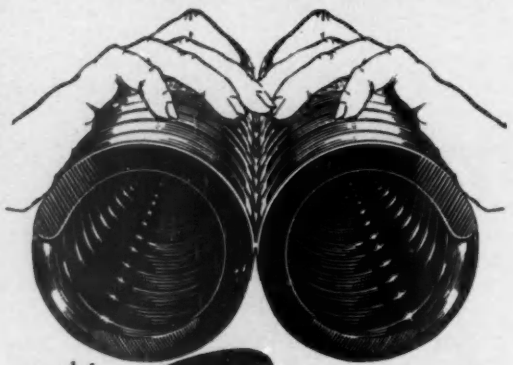

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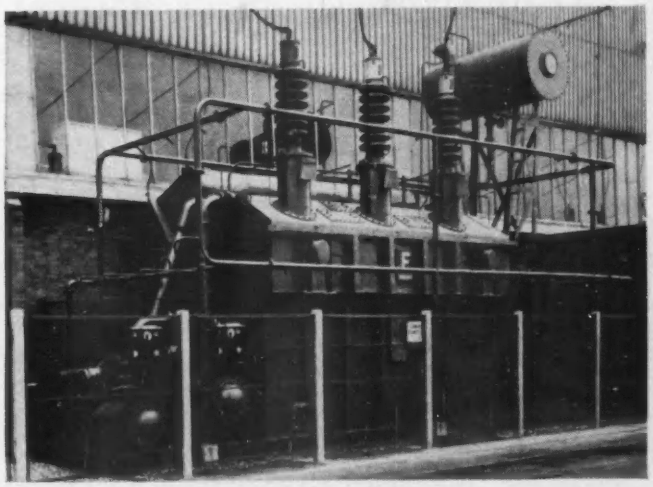

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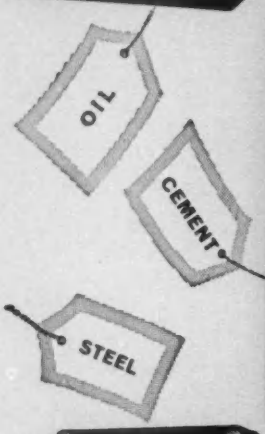

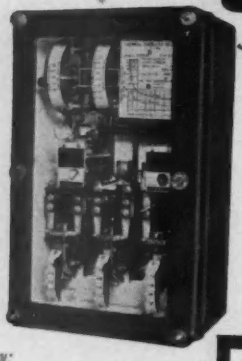

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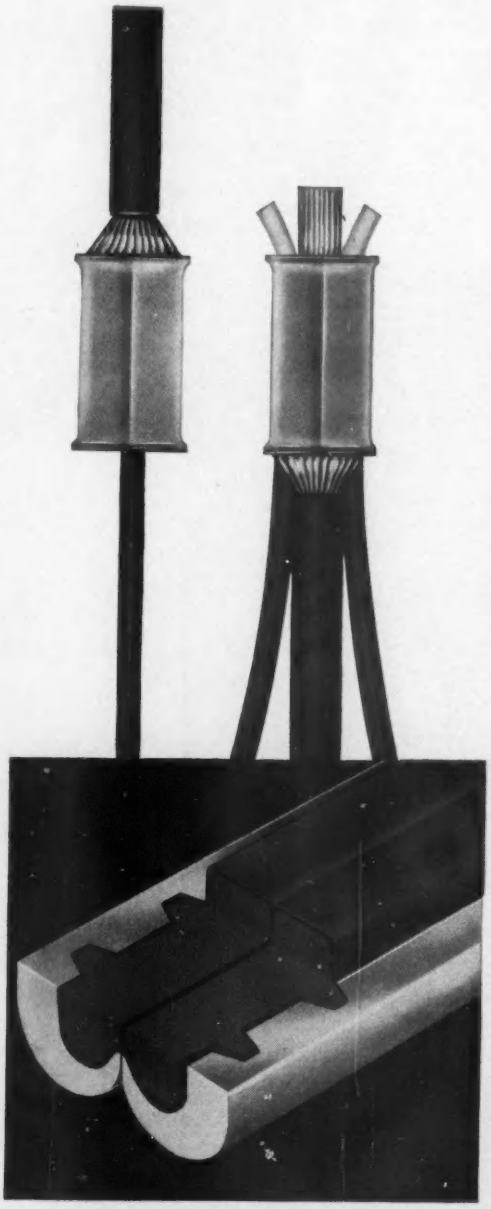

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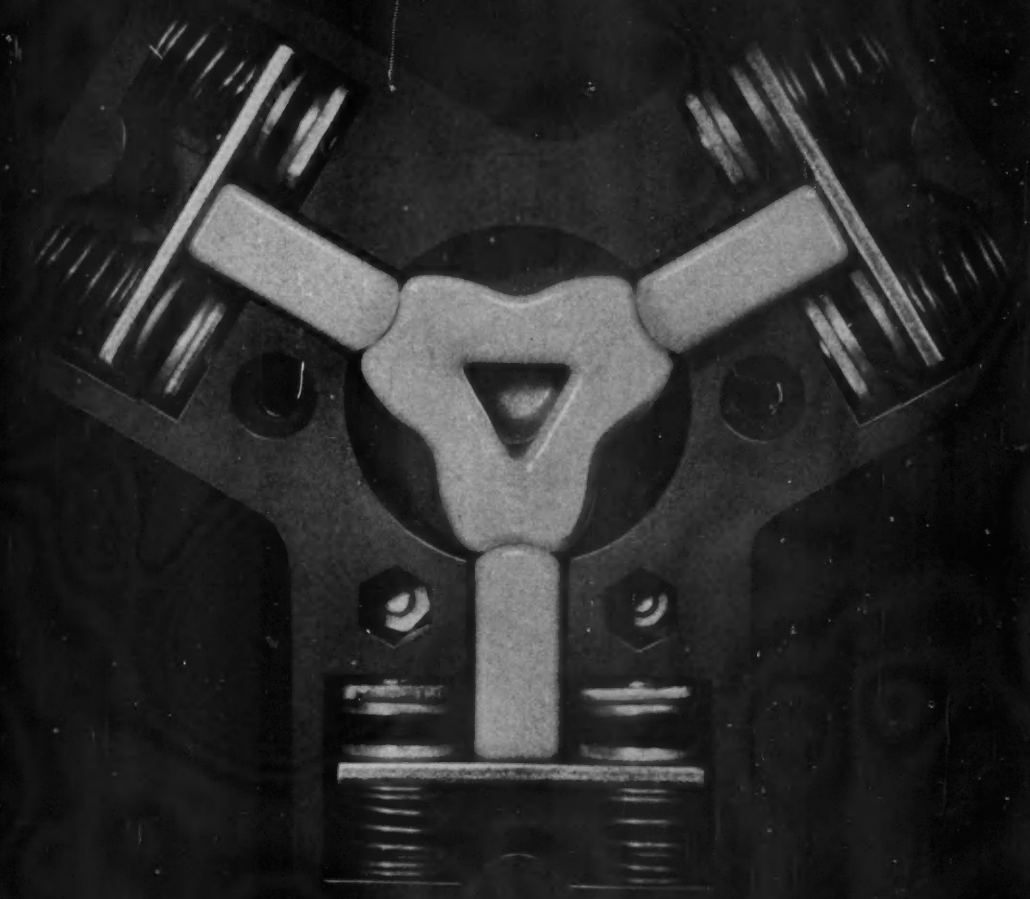

that's the New Approach of G.E.C.

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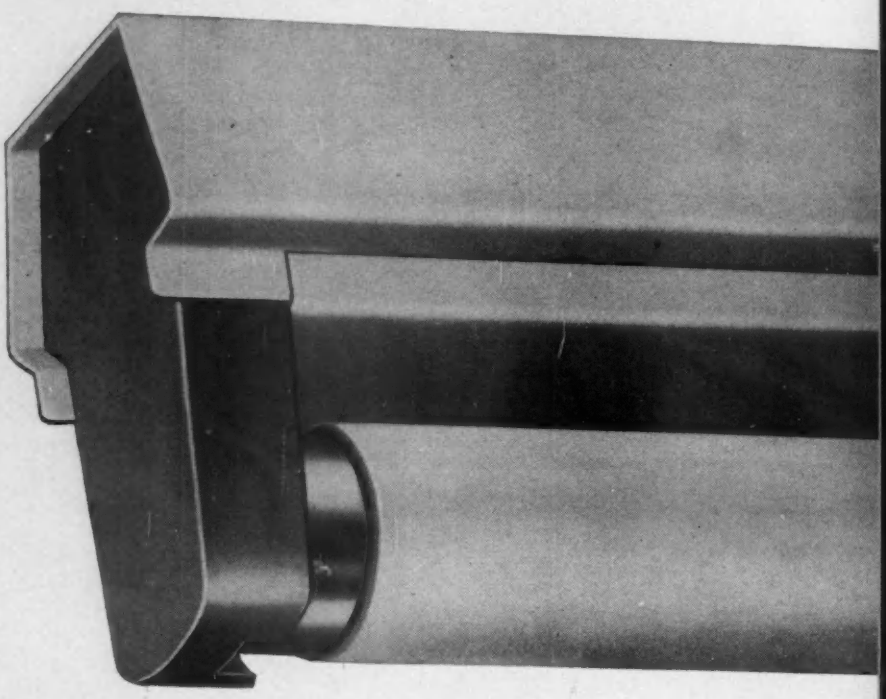

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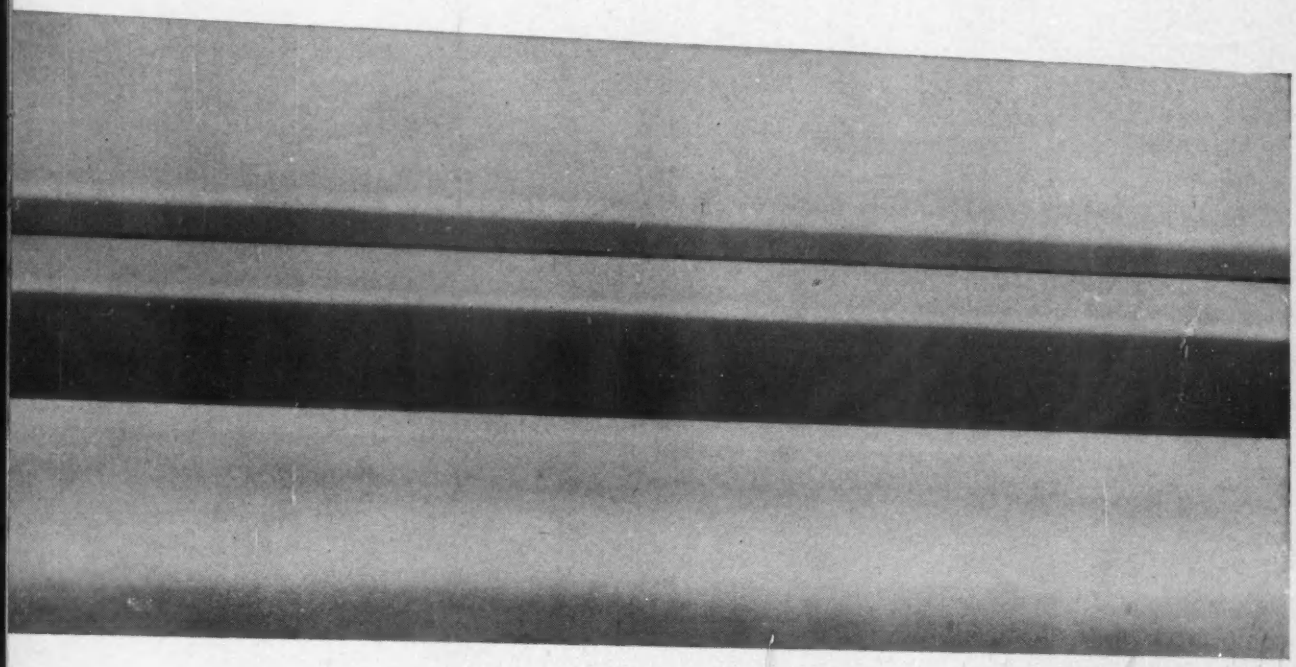

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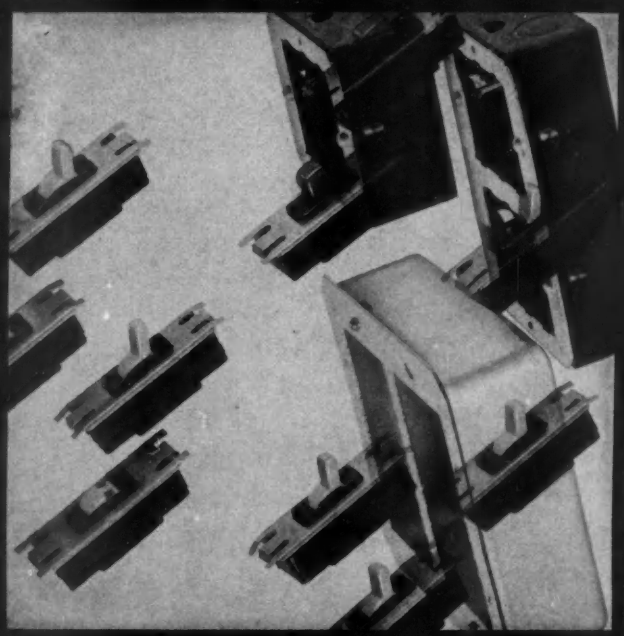

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- 15 amp 1 way S.P.
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- 5 amp 2 way S.P.
- 5 amp 2 way & off
- 5 amp intermediate
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- 5 amp 2 way secret
- Bell Push
- Neon Indicator
- Blanking Unit

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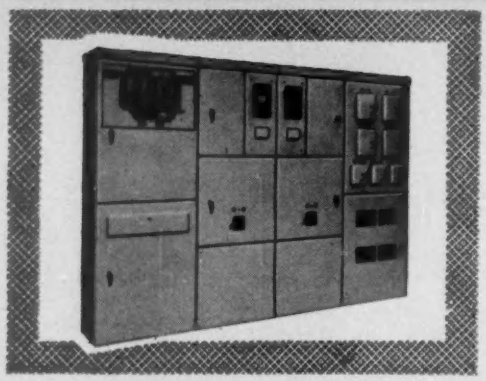

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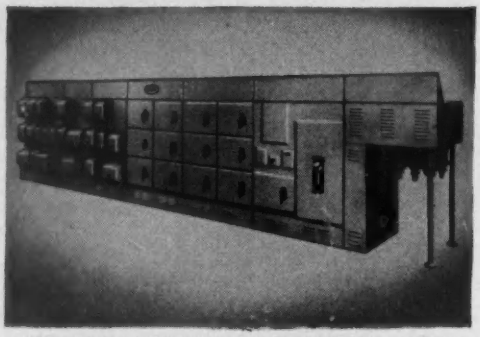

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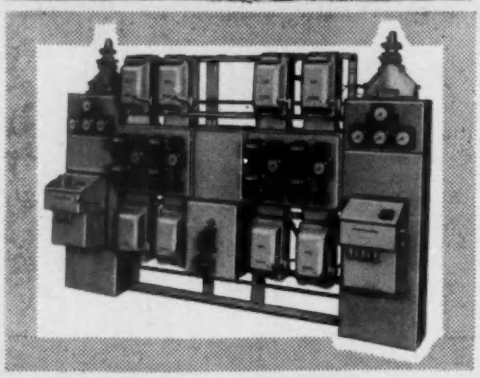

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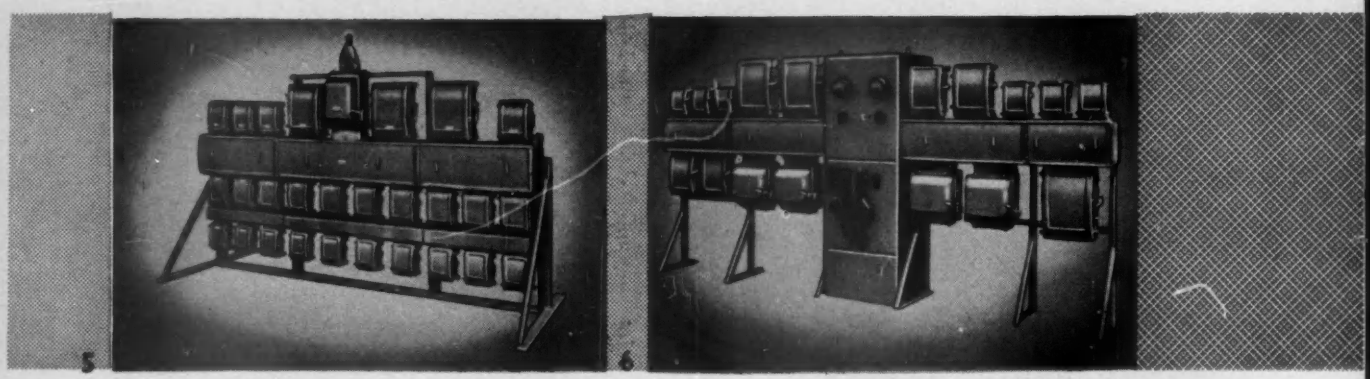

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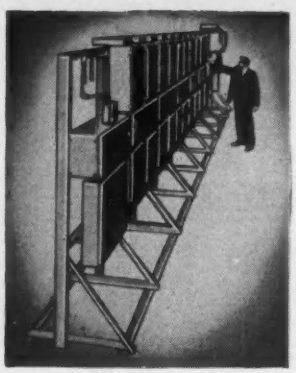

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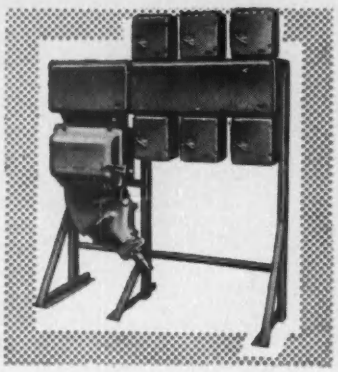

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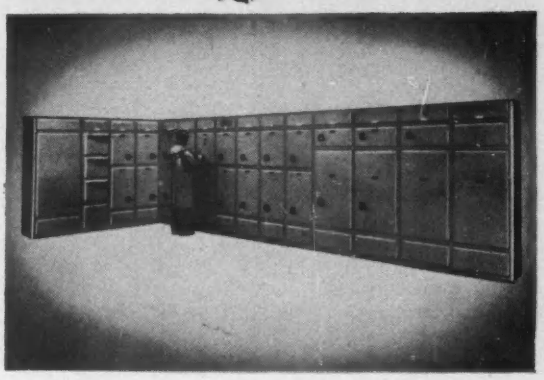


9

1 Cream coloured cubicle type Switchboard, incorporating mimic diagram of floor-warming circuits, made up of Star and S & S installation switches controlling all electrical services at a dock's reception area.

2 Star Monarch and Automatic Control Gear switchboard designed to control all services (and Floor-warming) for a Comprehensive School, Menai.

3 Specially designed switchboard incorporating Monarch units supplied to a Gas Board.

4 Multi-tier Star switchboard with incoming Monarch unit controlling kitchen in a Commercial Building, Birmingham.

5 Multi-tier Regent switchboard with Monarch incoming unit for an International Airport.

6 Switchboard built up with Regent and Monarch units designed for a Bristol Factory.

7 Busbar mounted multi-motor starterboard for an oil refinery.

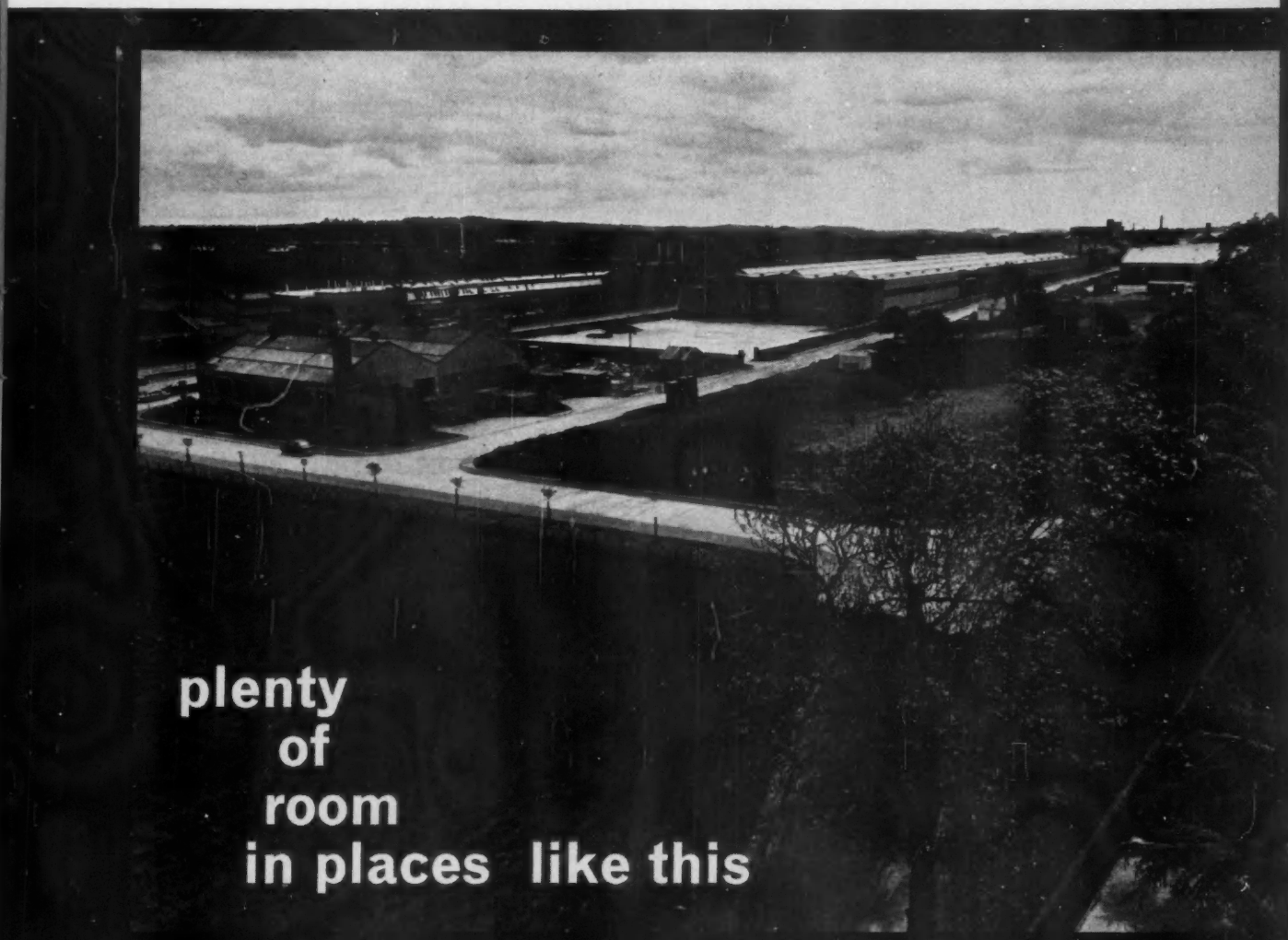
8 Star switchboard with Monarch incoming unit (with angled sealing chamber) supplied to a factory.

9 Multi-motor control cubicle for an oil storage installation, London.

Electrical Times, 29 June, 1961

COMPRESSED?

and take the road to the North



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SITES: There is an abundance of sites to suit the needs of most forms of industry, whether the location required is inland or by the sea.

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some manufacturers who have come, or are coming, North

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General Electric Company	—	(Inverness)
Partridge, Wilson	—	(Inverness)
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for further information write to: J. C. N. Baillie, Chief Commercial Engineer,
NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD, 16 Rothesay Terrace, Edinburgh, 3. Telephone: CALedonian 1361.

Breakdown—the price of false economy

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THURSDAY 29 JUNE, 1961
Registered as a Newspaper Volume 139 No. 26

ELECTRICAL TIMES

SARDINIA HOUSE SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Fuites de terre dans les systèmes de transmission ... 1027
On calcule les courants de fuite de terre ainsi que leur distribution pour un système de transmission typique auquel est appliqué une seule fuite ligne-terre. Les calculs sont effectués pour différentes positions de la fuite, et pour des conditions variables dans les connexions de transformateurs et les disjoncteurs à l'extrémité de ligne. Les valeurs du courant de fuite de terre déterminent le choix des relais d'impédance et de la capacité de rupture de l'appareillage de commutation.

Système de refroidissement pour groupe de 120 MW 1039
La chaleur sera extraite du condensat d'un turbo-alternateur de 120 MW en le faisant circuler à travers des échangeurs de chaleur à eau/air. Les échangeurs de chaleur se composent de feuilles d'aluminium montées sur des tubes dilatés, le tout se trouvant au bas d'une tour de refroidissement hyperbolique, qui fournit le tirage servant à aspirer l'air à travers l'échangeur. Le système élimine la nécessite d'avoir une eau refroidissante d'apport, et rend possible l'utilisation d'un condenseur à vaporisation. Les dimensions du soubassement de la salle des turbines sont par conséquent réduites.

Réduction des frais dans les travaux de câblage électrique 1040
On peut réduire les frais de câblage électrique grâce à une meilleure organisation sur les lieux. Le gaspillage des matériaux peut d'habitude être réduit des 10% conventionnels à 5%. Il est profitable de se servir de petits générateurs sur place pour alimenter l'outillage électrique. Le câblage et les bornes préfabriqués trouvent des applications de plus en plus nombreuses.

Câble traversant la Manche 1042
Une maquette de la station terminale pour le câble de 200 kV, courant continu, traversant la Manche montre l'implantation du matériel servant à le raccorder au superréseau britannique de 275 kV, courant alternatif.

In dieser Nummer

Erdfehler in Kraftübertragungssystemen 1027
Bei der Berechnung von durch Erdfehler verursachten Strömen sowie deren Verteilung wird ein typisches Kraftübertragungssystem zugrundegelegt, das einen einzigen Leitungserdfehler aufweist. Die Berechnung ist für Ortsveränderlichkeit der Fehler und veränderliche Verhältnisse bei den leitungsabschliessenden Schaltern und Transformatorenanschlüssen ausgelegt. Die Erdstromwerte werden bei der Wahl von Impedanzrelais und von Schaltvorrichtungen hinsichtlich deren Unterbrechungsvermögen verwertet.

Kühlsystem für einen 120 MW Generatorensatz ... 1039
Dem Kondensat eines 120 MW Turboalternators wird Wärme entzogen, indem man es durch Wasser/Luft-Wärmeaustauscher laufen lässt. Die Wärmeaustauscher bestehen aus Aluminiumplatten, die auf Streckmetallrohren am Boden eines hyperbolischen Kühlturmes befestigt sind, wobei dieser Turm den Luftstrom für den Wärmeaustauscher liefert. Das System macht die Bereitstellung von Zusatzkühlwasser überflüssig und ermöglicht die Verwendung eines Berieselungskühlers. Demzufolge kann auch die Turbinengrube kleiner gehalten werden.

Herabsetzung der Kabelverlegunskosten 1040
Falls der Planung am Installationsort genügendes Augenmerk geschenkt wird, lassen sich die Kosten bei der Verlegung elektrischer Leitungen reduzieren. Im allgemeinen kann der unnötige Verbrauch an Material von den herkömmlichen 10% auf 5% herabgesetzt werden. Die Verwendung kleiner Generatoren am Installationsort, die Strom für elektrisch betriebene Werkzeuge liefern, erscheint durchaus angezeigt. Immer öfter ergeben sich Gelegenheiten zur Vorfertigung von Kabelstrecken und-abschlüssen im Werk.

Das Kanalkabel 1042
Ein Modell des Endkraftwerkes für das 200 kV Gleichstromkabel zur überbrückung des Armelkanals zeigt den Anlageplan für den Anschluss an das britische 275 kV Wechselstrom-Hochspannungsnetz.

Earth Fault Current Distribution 1027
by A. Salzmann, DIPL.ING., A.M.I.E.E.

European Common Frequency 1031

Testing Airliner Components 1033

Making the Keymatic 1035

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SUBSCRIPTION RATES: United Kingdom £4, Overseas £4 10s per annum. Canada and USA $12 per annum. Subscriptions are payable in advance and may commence with any issue. Overseas subscriptions may be paid by banker's draft, cheque, international money order or credited to the Electrical Times Ltd., at Coutts and Co., 440 Strand, London WC2. Single copies price 1s 6d. Postage 6d.

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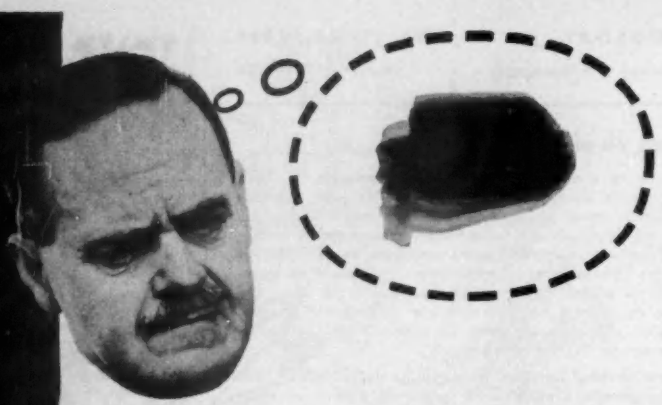

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 29 JUNE, 1961

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News Editor:
T. W. WRIGHT

Comment

IMPACT ON APPLIANCES

Against an inflationary background, electrical appliance sales, if not wholly deflated, are certainly quiescent. In such conditions, current rumours that the Chancellor is likely to resort to an increase in purchase tax through the operation of one of his economic stabilisers must appear alarming. However, as the Finance Bill is not yet through Parliament, the immediate prospect of such action can be discounted. The first line of retrenchment is likely to be by increase in Bank rate, a step currently expected. Of the two economic stabilisers proposed in the Budget, the payroll tax has had an unfavourable reception, not only by vested interests but by others as well. There is little doubt that if the economy still looks shaky in the autumn the Chancellor will decide to use one of these stabilisers, and it will be the increase in excise taxes that will be favoured first, though not necessarily the full 10%. Although the amount that will finally be added to the selling price so far as appliances are concerned may not be critical, it must seem hard that a section of the economy that appears not to be doing well should suffer further repressive measures. This is the price that must be paid for coming under the general excise umbrella, a concept that may ultimately be to the benefit of the appliance industry. There are more serious matters for manufacturers to face. Excess production capacity is still a major factor in this sector of the industry, too much so to be resolved alone by concentration on fewer models as a means of bringing down prices. It begins to appear that some of the drastic methods used in other sectors may have to be applied.

SCOTTISH ENTERPRISE

In our advertisement pages this week appears an invitation for industrialists to consider the advantages of North Scotland for their production plants. Publicity of this kind for various special areas, notably Northern Ireland, has become familiar enough in recent years. What is special about the North Scotland advertisement is that it is the Hydro-electric Board that has issued it. This is a courageous step by a Board under investigation to see whether its special duties are relevant to today's needs; for it is the special "fairy godmother" clause in the 1943 Act, different from that in any other electricity legislation, that gives warrant for the effort. Under that Act, the Board is enjoined to collaborate in the development and social improvement of North Scotland. This duty the Board has interpreted in several ways during its adventurous life, but the present campaign to attract industry to the area is undoubtedly the most direct exercise of the

special powers. The campaign is no passive business of advertise and hope. Groups of manufacturers are taken to the area and shown round. Availability of labour is an important attraction, difficulties of transport to large markets an obvious drawback. The Hydro Board's low electricity tariffs play a not insignificant part in tilting the scales in favour of the area. In this work, the Board co-operates closely with local government authorities, who have the same interests at heart, and the entire scheme typifies the particularly close relationship that has been built up between the Board and its customers. That relationship is a reflection, in special circumstances, of the integration of electricity supply with modern commercial life that is apparent generally.

POWER ON SITE

Electrical installation work is a field of business where watching details can have a sharp effect on eventual profitability; or, indeed, on continued existence as a contractor. Among suggestions on this theme that a contributor makes this week is a call for more readiness to use power tools on site. The backwardness of the average contractor in this respect has always been something of a puzzle. Even when a mains supply is not available, the magnitude of savings possible with reasonable use of power tools seems likely to repay the expense and trouble of running a mobile generator. Perhaps the answer lies in the chronic under-capitalisation of most contracting businesses, which, as speakers at the recent ECA conference alleged, fail to provide a margin in their tenders for the degree of self-financing of future expansion which is accepted as desirable today in other industries. It is the same problem which has seemed to underlie the reluctance of many contractors to equip themselves with the amount of test equipment which is authoritatively reckoned as desirable. Mr Barlow, in his ECA conference paper, reckoned that the labour content of electrical contracting was as high as 50% of cost. That signals broad opportunity for mechanisation. As a corollary, there may be more scope than is generally accepted today for preparing some of the installation material and, indeed, the wiring, either off-site altogether or in central site workshops on large contracts.

SERVICE OVERSEAS

British engineers are becoming increasingly reluctant to serve in the countries of the British Commonwealth that are emerging to independence. The problem has been emphasised recently by the secretary of the Engineers' Guild, and it received an airing as well in the recent report of the Uganda Electricity Board. UK nationals are unwilling to spend a considerable time in an African country, for example, in public service when they know that by the time they reach the age at which they might expect the more senior appointments africanisation is likely to have become reality. Position and pension, two important considerations in attracting staff to service overseas in the past, no longer seem so sure. For electricity supply engineers, there may be a way out that can work to the advantage of supply authorities both at home and in the Commonwealth. It is common ground that Europeans will be needed for some time to fill technical and managerial posts in electricity supply abroad. At home, it is generally agreed that there is difficulty in obtaining as wide a range of experience as is desirable in the service of the CEGB and the area boards, while maintaining a good standard of specialised knowledge. A system of secondment of volunteers for service with overseas supply authorities for periods of three years to five years, with British supply authority pensions maintained and re-employment guaranteed, should not present insuperable difficulties. It has much to commend it. Although initially the advantage would seem to lie with the overseas authorities, the heavier responsibility thrown on to young shoulders in less highly developed supply organisations should have a long-term value for their British employers. So should the experience of novel problems, technical and administrative.

ENHANCED STATUS FOR C.A.T's

Courses for the Diploma in Technology are largely centred on the nine Colleges of Advanced Technology which the Ministry of Education has recognised. Now the Minister has decided to remove these colleges from the jurisdiction of the local authorities who in most cases have built them up. They are to be provided with governing bodies and financial arrangements more in line with the universities. This is a step which will be welcome from the prestige point of view; the "parity of esteem" with a university degree which was one of the criterions for the successful Dip.Tech. course will be helped. But there are more direct practical reasons. The full potentiality of the Colleges of Advanced Technology will be realised only if the best staff is attracted and maintained, and in getting that staff the colleges are directly in competition with universities. By removing them from the local education authority ambit, certain difficulties about Burnham scales for salaries compared with university scales will be avoided. The Minister will be free to negotiate separate scales appropriate to the range of work being carried out in the colleges. This, to an increasing extent, includes advanced studies and research, together with the organisation of special courses for particular industries and types of study. The signs are that the Colleges of Advanced Technology are a part of the higher educational scheme that industrial employers like. Their long-term place in the system will be evaluated in the report of the committee under the chairmanship of Lord Robbins now studying advanced education generally. In the interim, the new move is welcome.

Meteor

This week's quick summary of electrical news faces advertisement page 8

Earth fault current distribution

CALCULATION FOR TRANSMISSION SYSTEMS

by A. Salzmann, DIPL.ING., A.M.I.E.E.

MODERN distribution practice provides that voltage stresses arising from earth faults and insulated neutrals are converted into current stresses by earthing the system neutral, either solidly, or via a resistance or a reactance. In this manner the magnitude of the earth fault current can be controlled. Undesirable distribution of earth fault currents in a power transmission system may result from:

(a) Increasing the number of supply points and system neutral earthing points.

(b) Paralleling transformers with dissimilar zero sequence impedances, such as delta-star and star-interconnected-star units, when the transformer with the smaller zero sequence impedance will carry the larger portion of the fault current.

(c) Faults arising from single and double line-to-earth short-circuits and the fault current exceeding the three-phase short-circuit current.

This article deals with various problems of fault current distribution arising from the transmission of power when an earth fault occurs. Our object is to determine firstly, the current distribution between faulty and healthy phases and then to assess whether over-current starting relays for switched impedance protection are applicable. Secondly, to illustrate that the earth fault current is not shared in proportion to the nominal rating if transformers operating in parallel have dissimilar zero sequence impedances. Finally, to reassess the rated rupturing capacity of switchgear in case the earth fault current exceeds the three-phase short-circuit current.

Single Line-to-earth Fault

Let us consider a typical transmission system shown in Fig. 1. Two networks (A) and (B) are interconnected through step-up and step-down transformers and a 132 kV o/h line, having one overhead earth wire. For clarity we assume infinite busbars at (A) and (B), negligible resistance and capacitance of the transmission system elements, solidly earthed neutrals and fault currents which return to the neutral points through the earth path only.

The fault current and its distribution resulting from, say, a line to earth fault at location A_1 can be determined by aid of symmetrical components. For this type of fault, assuming zero fault resistance and that both system neutrals of the supply points (A) and (B) are solidly earthed (switches a and b closed), the sequence networks are connected in series as in Fig. 2a. It is interesting to note that not only the faulty phase but the healthy phases as well carry fault current, as shown in Fig. 3 (see example).

For a line-to-earth fault involving the red phase:

$$I_F = 3I_1 = 3I_2 = 3I_0 = 3\,V_{PH}/(Z_1 + Z_2 + Z_0) \quad (1)$$

where Z_1, Z_2, Z_0 are sequence impedances viewed from the fault location A_1 and equal to:

$$Z_1 = Z_2 = Z_1' \,.\, Z_1''/(Z_1' + Z_1'') \quad .. \quad .. \quad (2)$$

$$Z_0 = Z_0' \,.\, Z_0''/(Z_0' + Z_0'') \quad .. \quad .. \quad .. \quad (3)$$

Here $Z_1' = Z_2'$, and Z_0' are sequence impedances of the transformer A and $Z_1'' = Z_2''$ and Z_0'' are sequence impedances of the transmission line L and the transformer B.

The sequence currents and their distribution are derived from Fig. 2 and are:

$$I_1' = I_2' = I_F \,.\, Z_1''/3(Z_1' + Z_1'') \quad .. \quad .. \quad (4)$$

$$I_1'' = I_2'' = I_F \,.\, Z_1'/3(Z_1' + Z_1'') \quad .. \quad .. \quad (5)$$

$$I_0' = I_F\, Z_0''/3(Z_0' + Z_0'') \quad .. \quad .. \quad .. \quad (6)$$

$$I_0'' = I_F\, Z_0'/3(Z_0' + Z_0'') \quad .. \quad .. \quad .. \quad (7)$$

The fault currents flowing through the neutral earthing points, see Fig. 3, are:

$$I_{RN}' = 3.I_0' = I_F.Z_0''/(Z_0' + Z_0'') \quad .. \quad .. \quad (8)$$

$$I_{RN}'' = 3.I_0'' = I_F.Z_0'/(Z_0' + Z_0'') \quad .. \quad .. \quad (9)$$

Viewed left from fault location A_1 (Fig. 3) the phase fault currents are:

$$\left.\begin{aligned} I_R' &= I_0' + I_1' + I_2' \\ I_Y' &= I_0' + a^2 I_1' + a I_2' \\ I_B' &= I_0' + a I_1' + a^2 I_2' \end{aligned}\right\} \quad .. \quad .. \quad .. \quad (10)$$

Viewed right from the fault location A_1:

$$\left.\begin{aligned} I_R'' &= I_0'' + I_1'' + I_2'' \\ I_Y'' &= I_0'' + a^2 I_1'' + a I_2'' \\ I_B'' &= I_0'' + a I_1'' + a^2 I_2'' \end{aligned}\right\} \quad .. \quad .. \quad (11)$$

where $a = 1\angle 120°$; $a^2 = 1\angle 120°$ are vector operators.

Numerical Example

Transformers (A) and (B) are rated 60 MVA, 11/132 kV and 132/11 kV respectively. Positive and negative sequence impedances $X_{T1} = X_{T2} = 10\%$,

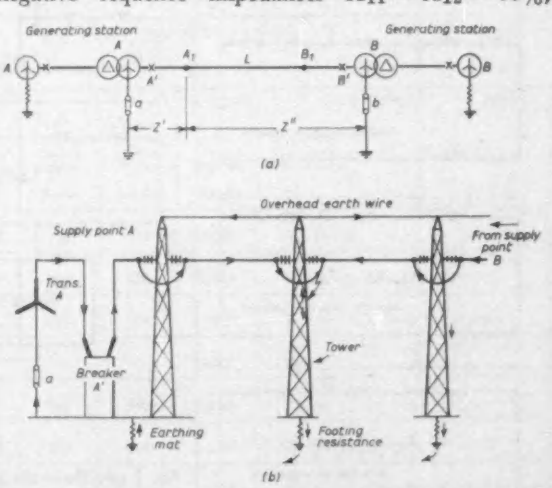


Fig. 1 (a). Single-line diagram of an interconnected power system. The earthing schemes for station A are shown at (b) and also in Fig. 8

or 29 ohms referred to the 132 kV side. Zero sequence impedance $X_{T0} = 0{\cdot}8.X_{T1} = 23{\cdot}2$ ohms. Both units are solidly earthed.

Overhead Line

Overhead line: Length 45 miles, conductor area 0·175 sq in., reactance 30 ohms. The resistance and system capacitance are neglected. Sequence impedances are: $Z_{L1} = Z_{L2} = 30$ ohms;
$Z_{L0} = 2{\cdot}5.Z_{L1} = 75$ ohms, assuming one o/h earth wire.

Sequence impedances: Viewed from left of fault location, A_1:

$Z_1' = Z_2' = 29$ ohm; $Z_0' = 23{\cdot}2$ ohm.

Viewed from right of fault location A_1 we have:

$Z_1'' = Z_2'' = 59$ ohm; $Z_0'' = 98{\cdot}2$ ohm.

Viewed from fault location we have:

$Z_1 = Z_2 = 19{\cdot}45$ ohm..(2); $Z_0 = 18{\cdot}8$ ohm..(3)

Total fault current:

$$I_F = 3.132.10^3/\sqrt{3}(Z_1 + Z_2 + Z_0) = 3960A \quad .. \quad (1)$$

Sequence currents:

$I_0 = I_1 = I_2 = I_F/3 =$ 1320A

Sequence currents viewed from left of fault A_1:

$I_1' = I_2' = 1320.59/88 = 886A$ .. .. (4)

$I_0' = 1320.98{\cdot}2/121{\cdot}4 = 1070A$ .. .. (6)

Sequence currents viewed from right of A_1:

$I_1'' = I_2'' = 433A$ .. .. (5)

$I_0'' = 250A$ .. .. (7)

Total fault current viewed from left of A_1:

$I_{RN}' = 3I_0' = 3210A$ .. .. (8)

Total fault current viewed from right of A_1:

$I_{RN}'' = 3I_0'' = 750A$ .. .. (9)

Phase currents viewed from left of A_1:

$I_R' = I_0' + I_1' + I_2' = 2842A$ .. .. (10)

$I_Y' = 1070 + (-0{\cdot}5 - j0{\cdot}866).886 + (-0{\cdot}5 + j.0{\cdot}866).886 = 184A$ (10)

$I_B' = 184A$ .. .. (10)

In a similar manner we obtain the phase currents viewed from the right of fault location A_1:

$I''_R = 1118A$; $I_Y'' = 184A$; $I_B'' = 184A$ .. (11)

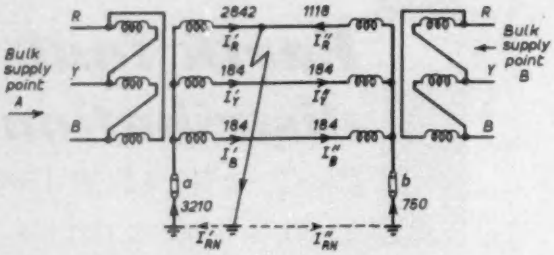


Fig. 3. The distribution of fault current for the line-to-earth fault at A_1, shown in Fig. 1

These current values for the faulty phase, healthy phases and return earth fault path are entered on Fig. 3.

Applying the principle outlined above, we can determine the fault current distribution when varying the number of bulk supply points and system neutral earthing points. These current values are entered in Table No. 1.

We notice that for one in-feed and neutral earthing on the supply side, the faulty phase only carries current while the healthy phases remain unaffected (see Table, line 4 and 7). On the other hand, for neutral earthing on the load side only, assuming one supply point, the current flowing in the sound phases related to the faulty phase is considerable (Table, line 5).

It follows that the magnitude of the total fault current and, consequently, the fault current distribution can be controlled by varying the number of supply points and by the method of system neutral earthing, see Figs. 4 and 5.

However, it should be noted that, when taking into account finite busbars, line and fault resistances, and system capacitance, the fault current distribution is also derived by using symmetrical components as in Fig. 2b.

It is clear that, when selecting switched impedance protection schemes, if relay operation is initiated by over-current starting relays, maloperation may result from the undesirable operation of these over-current starting relays. The object of these calculations is the determination of optimum settings for the starting relays. If such relays prove inadequate, the calculations will indicate as the correct solution the use of under-impedance starting relays.

Another problem which arises from the earth fault current distribution for systems with multiple earthed neutral is that the zero phase sequence impedance may not be constant even though the ground conductivity remains constant. Obviously, the impedance relay will not measure the true earth fault loop impedance because the current applied to the relay will be greater than that through the fault return path, see Fig. 6a. The impedance relay will therefore over-reach.

It follows that if the current applied to the relay is (a) compensated by adding a proportion of the healthy phase current to the faulty phase current (as in

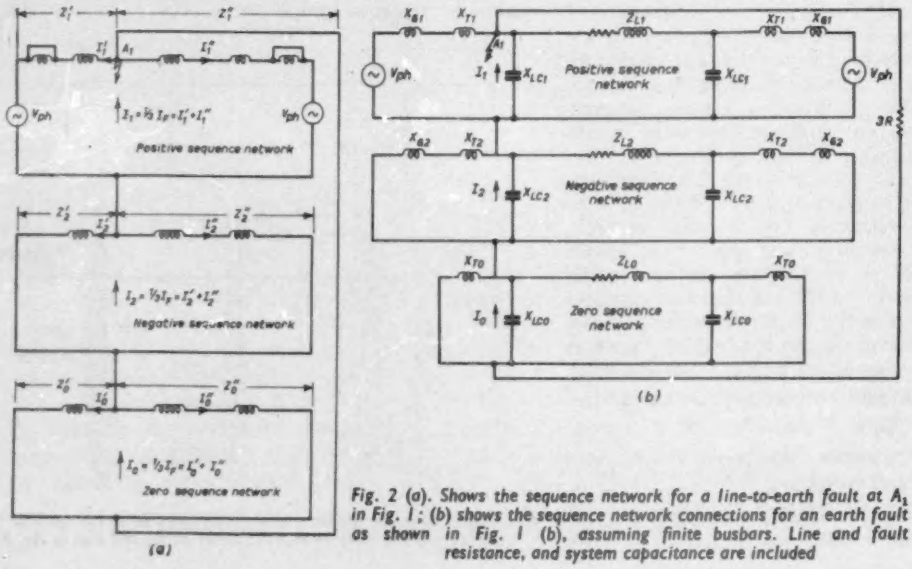


Fig. 2 (a). Shows the sequence network for a line-to-earth fault at A_1 in Fig. 1; (b) shows the sequence network connections for an earth fault as shown in Fig. 1 (b), assuming finite busbars. Line and fault resistance, and system capacitance are included

the Reyrolle system) or (b) a percentage of the residual current is added to the faulty phase current, assuming the ohmic setting is based on the minimum zero sequence impedance (AEI system), the relay will measure the distance accurately in both cases under any earth fault conditions.

The circuit for system (a) is shown in Fig. 6b. Here we inject into the relay for each phase a current in proportion to the vector sum of the other two phases by means of auxiliary c.t's.

For residual compensation, system (b), the circuit is shown in Fig. 6c. The residual current to be added to the phase current can be derived by using symmetrical components as follows:

Let the current in the phases R, Y, B be I_R', I_Y' and I_B'.

Expressed in terms of symmetrical components, these are:

$$I_{R1}' = (I_R' + a\,I_Y' + a^2\,I_B')/3$$
$$I_{R2}' = (I_R' + a^2\,I_Y' + a\,I_B')/3$$
$$I_{R0}' = (I_R' + I_Y' + I_B')/3$$

The voltage to earth V_{RE}' of the faulty phase is now:

$$V_{RE}' = I_{R1}'\,Z_1 + I_{R2}'\,Z_2 + I_{R0}'\,Z_0$$

where Z_1, Z_2, Z_0 are the sequence impedances.

Combining these equations and substituting for $Z_1 = Z_2 = Z$; $Z_0 = K.Z$ we obtain:

$$V_{RE}' = Z[(K-1)\,(I_R' + I_Y' + I_B') + 3\,I_R']/3$$
$$Z = V_{RE}'/[I_R' + (I_R' + I_Y' + I_B')\,(K-1)/3]$$

For a 132 kV line, $K = 1{\cdot}73/0{\cdot}711 = 2{\cdot}43$ and $(K-1)/3 = 0{\cdot}48$.

For the circuit illustrated in Fig. 4c:

$$Z_0 = V_{RE}'/I_R' = [I_R' + I_R'Z(K-1)/3]/I_R'$$
$$Z_0 = 1{\cdot}48Z$$

Paralleling Transformers

If transformers having identical phase sequence impedances, for example, delta-star connected, are subjected to line-to-earth faults, it is assumed that the zero sequence impedance denoted by X_{t0} has the same value as the phase-to-neutral impedance X_{t1} and equality of primary and secondary ampere-turns exists for zero sequence current. These conditions are illustrated in Fig. 7a, for a fault at location "F" and breaker (a) open and (b) closed.

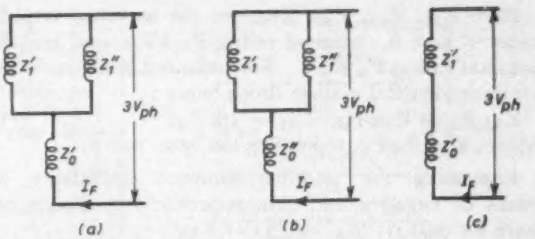


Fig. 4. Sequence networks for a single line-to-earth fault: (a) two supply points and breaker b open; (b) two supply points and breaker a open; (c) one supply point A and breaker b open

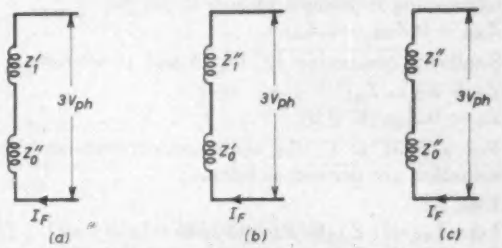


Fig. 5. Sequence networks, line-to-earth fault: (a), one supply point A and breaker a open; (b) one supply point B and breaker b open; (c) one supply point B and breaker a open

For star interconnected-star units and a line-to-earth fault at F with breaker (b) open and (a) closed, the balance of ampere-turns for zero sequence current exists within the secondary winding. No zero sequence current is present in the primary winding because of the star-connected winding with free neutral. Here the zero sequence impedance is smaller than the positive sequence impedance, usually about $0{\cdot}05X_{t1}$ to $0{\cdot}1X_{t1}$.

It follows that for transformers with dissimilar zero sequence impedances operating in parallel, and breakers (a) and (b) closed, the fault current will not be shared in proportion to the nominal rating of the units. The transformer with the smaller zero sequence impedance has to carry a larger portion of the fault current.

This problem can be best solved using symmetrical components. The sequence networks for the circuit, Fig. 7a is shown in Fig. 7b and assumes zero fault resistance. For a line-to-earth fault, equation 1 applies. Z_1, Z_2, Z_0 are sequence impedances viewed from the fault and equal to:

$$Z_1 = Z_2 = Z_{A1}.Z_{B1}/(Z_{A1} + Z_{B1}) \quad .. \quad .. \quad (12)$$
$$Z_0 = Z_{A0}.Z_{B0}/(Z_{A0} + Z_{B0}) \quad .. \quad .. \quad .. \quad (13)$$

Table I. Fault current distribution

	Fault Location A, Number of Supply and Neutral Earthing Points	Fault Current Amps			Fault Current Red Phase Amps		Fault Current Yellow Phase Amps	Fault Current Blue Phase Amps	3 Ph. Fault Current Amps	Sequence Network Connections	Remarks
		Via Fault	Via Breaker (a)	Via Breaker (b)	Supply Side A	Supply Side B					
1	Supply Points A and B Breakers: (a) and (b) closed	3 960	3 210	750	2 842	1 118	184	184	2 630*	Fig. 2a	—
2	Supply Points A and B Breaker: (a) closed; (b) open	3 960	3 960	—	3 092	868	434	434	2 630*	Fig. 4a	$I_0^1 = I_F/3$; $I_0^{11} = 0$
3	Supply Points A and B Breaker: (a) open; (b) closed	1 670	—	1 670	750	922	374	374	2 630*	Fig. 4b	$I_0^1 = 0$; $I_0^{11} = I_F/3$
4	Supply Point A Breaker: (a) closed; (b) open	2 820	2 820	—	2 820	—	—	—	2 630*	Fig. 4c	$I_0^{11} = I_0^{11} = 0$; $I_0^{11} = 0$ $I_0^{11} = I_F/3$
5	Supply Point A Breaker: (a) open; (b) closed	2 820	—	2 820	1 880	940	940	940	2 630*	Fig. 5a	$I_0^{11} = I_0^{11} = 0$; $I_0^1 = 0$
6	Supply Point B Breaker: (a) closed; (b) open	1 620	1 620	—	540	1 080	540	540	1 290†	Fig. 5b	$I_0^{11} = 0$; $I_0^1 = I_F/3$
7	Supply Point B Breaker: (a) open; (b) closed	1 050	—	1 050	—	1 050	—	—	1 290†	Fig. 5c	$I_0^1 = 0$; $I_0^{11} = I_0^{11} = I/F3$

* Flowing via Breaker A¹. † Flowing via Breaker B¹.

Here Z_{A1}, Z_{B1}, Z_{A0}, Z_{B0}, are the sequence impedances of unit A, nominal rating P_A kVA, and unit B, nominal rating P_B kVA. For balanced load condition we have identical voltage drops hence:

$$Z_{A1} P_A = Z_{B1} P_B;\ Z_{B1} = 1/k\ Z_{A1} \quad .. \quad .. \quad (14)$$

where, $k = P_B/P_A$, represents the ratio factor.

Expressing the positive sequence impedance in terms of negative and zero sequence impedances we have for unit A: $Z_{A1} = Z_{A2} = Z_{A0}$

and for unit B:

$$Z_{B1} = Z_{B2};\ Z_{B0} = b\,Z_{B1} = b\,Z_{B2};\ (b<1) \quad .. \quad (15)$$

Combining Equations 14 and 15 we get:

$$Z_{B0} = b.Z_{B1} = c.Z_{A1}/k \quad .. \quad .. \quad .. \quad (16)$$

Similarly, combining 12, 13, 14 and 16 we have:

$$Z_1 = Z_2 = Z_{A1}/(1 + k) \quad .. \quad .. \quad .. \quad (17)$$

$$Z_0 = b.Z_{A0}/(k + b) \quad .. \quad .. \quad .. \quad .. \quad (18)$$

For a fault at F, the sequence currents and their distribution are derived as follows:

Unit A:

$$I_{A1}=I_{A2}=I_1\ Z_{A1}/k(Z_{A1}+Z_{A1}/k)=I_F/3(1+k) \quad (19)$$

$$I_{A0}=bI_1\ Z_{A0}/k(Z_{A0}+bZ_{A0}/k)=I_F.b/3(k+b) \quad .. \quad (20)$$

Unit B:

$$I_{B1} = I_{B2} = kI_F/3(1 + k) \quad .. \quad .. \quad .. \quad (21)$$

$$I_{B0} = kI_F/3(k + b) \quad .. \quad .. \quad .. \quad .. \quad (22)$$

Combining the sequence currents, the fault current distribution is as follows:

Unit A:

$$I_A=I_{A1}+I_{A2}+I_{A0}=I_F/3[2/(1+k)+b/(b+k)] \quad (23)$$

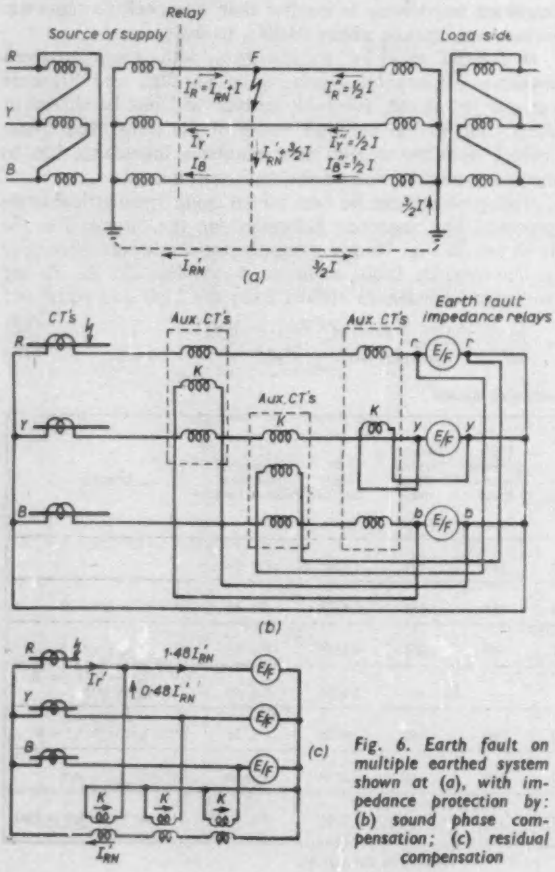


Fig. 6. Earth fault on multiple earthed system shown at (a), with impedance protection by: (b) sound phase compensation; (c) residual compensation

Unit B:

$$I_B=I_{B1}+I_{B2}+I_{B0}=I_F/3[2k/(k+1)+k(b+k)] \quad (24)$$

Alternatively, expressing the fault in terms of voltages and sequence impedances:

$I_1=I_2=I_0=V_{PH}/(Z_1+Z_2+Z_0)=I_F/3$. See equ. 1. Combining equations 1, 15, 17, 18, 23 we obtain:

$$I_A = V_{PH}/Z_{A1} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (25)$$

Similarly, expressing Z_1, Z_2, Z_0 in terms of Z_B, and when combining Equations 1, 14, 15, 16 and 24, we obtain:

$$I_B = k\ V_{PH}/Z_{B1} = k_1.\ k\ .\ V_{PH}/Z_{A1} \quad .. \quad .. \quad (26)$$

where:

$$k_1 = (1 + 2b + 3k)/(b\,k + 3b + 2k).$$

It follows that the star/interconnected-star unit carries a larger proportion of the fault current, depending on the magnitude of the factors k and b. For $k=P_b/P_a=1{\cdot}0$ and $b=0{\cdot}1$, that is, transformers with identical ratings but dissimilar zero sequence impedances, unit B with the smaller zero sequence impedance supplies 63·5% and unit A 36·5% of the total fault current. ($I_a=0{\cdot}365\ I_F$; $I_b=0{\cdot}635\ I_F$). For $k=1{\cdot}0$ and $b=1{\cdot}0$, both units have identical ratings and zero sequence impedances and share the fault current equally, assuming the star-interconnected unit is replaced by one which is delta-star connected.

From these calculations it follows that the fault current is not shared in proportion to the nominal rating, if transformers operating in parallel have dissimilar zero sequence impedances.

Switchgear Rating and Fault Current

In general, any reduction in zero sequence impedance as occurs, for example, on an interconnected system with multiple-earthed neutral and several bulk supply points, will result in an increase in the total fault current flowing to earth. This current may exceed the current arising from a direct three-phase short-circuit, occurring at the same location. From the distribution of fault currents in various circuits we can derive the earth fault current.

Consider Fig. 2 again. The three-phase symmetrical fault current at location A_1 is $I_{3ph}=V_{ph}/Z_1$. Comparing this formulae with eq. 1 it can be seen that both currents, the three-phase and the single, line-to-earth current are identical if $Z_1=Z_2=Z_o$. However, the earth fault current is larger if $Z_0<Z_1$ as would occur at a tail-end feeder and with the fault close to the source of supply or on large interconnected networks having neutral points solidly earthed.

As an illustration: The three-phase fault current for a fault at A_1 flowing through circuit-breaker A^1 (see Fig. 1 and Fig. 2) is equal to

$$I_3'_{PH} = I_{3PH}.\ Z_1''/(Z_1' + Z_1'')$$

where:

$$I_{3PH} = 132 \times 10^3/[\sqrt{3}\ Z_1'\ .\ Z_1''/(Z_1' + Z_1'')] = 3{,}920\ \text{A}.$$

representing the total three-phase fault current. Thus we obtain $I'_{3\varphi}=3{,}920.59/(29+59)=2{,}630$A against $I_{1\varphi}=2{,}842$A being the single line-to-earth fault current flowing through breaker A^1 (see Table 1, line 1). The breaking capacity rating $\sqrt{3}.I_{1ph}.V.10^{-3}$ MVA based on earth fault conditions is larger than for a three-phase fault. From inspection of Table 1 it follows that the fault current arising from line-to-earth faults is in some cases larger than the symmetrical three-phase fault current.

However, the earth fault current may be considerably larger than the three-phase fault current if changes in circuit configuration take place. For instance, replacing

transformer A by several units operating in parallel and earthing their neutral points solidly would increase the earth fault current considerably because of the reduction in the zero sequence impedance.

It should be emphasised that inclusion of tower footing resistances causes a reduction in the earth fault current. For the arrangement in Fig. 1(b), the earthed wood poles or steel towers are connected via an overhead earth wire. In the event of a line-to-earth fault the zero phase sequence impedance is increased due to the parallel-connected footing resistances, so causing a decrease in the fault current. For the arrangement shown in Fig. 8, the overhead wire is insulated from the towers and station earth mat, the fault resistance consisting of the footing resistance of one tower only, in series with the station mat resistance. Here, the reduction in fault current is very considerable.

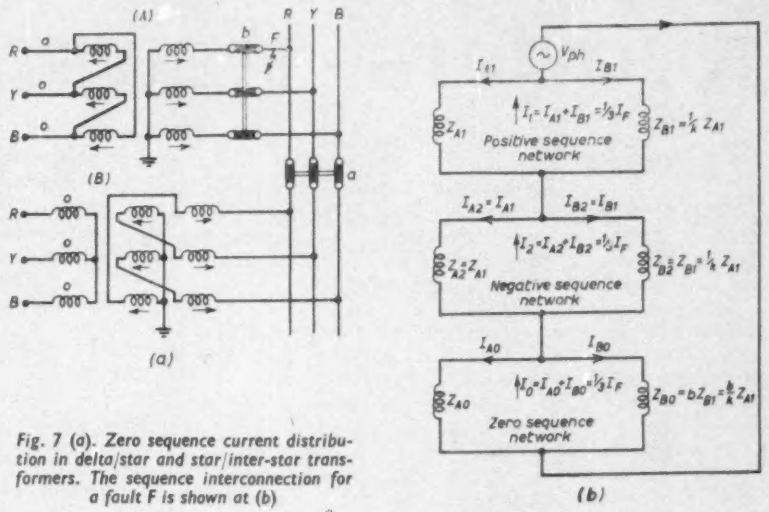


Fig. 7 (a). Zero sequence current distribution in delta/star and star/inter-star transformers. The sequence interconnection for a fault F is shown at (b)

An alternative solution is the application of the method of system neutral earthing known as "Partially Solid Earthing," which leads to the reduction of the earth fault current as well. Here, the transformers at stations A and B (Fig. 1) are replaced by several units operating in parallel. The neutrals of some of the transformers are solidly earthed, while the rest operate with insulated neutrals. It is obvious that by adopting this earthing method, the zero sequence impedance becomes larger, and consequently the earth fault current becomes smaller.

Summarising, the inclusion of footing resistances in the fault circuit makes the fault current smaller than the calculated value. This follows from the revised equation: $I_F = 3V_{ph}/(Z_1+Z_2+Z_o+3R)$ where R represents the tower footing resistances connected in parallel, plus the station mat resistance. The reduction in current is considerable if the ratio $(X_1+X_2+X_o)/R$ is low.

Conclusion

Knowledge of the magnitude of the earth fault current and its distribution enables us to solve a variety of problems arising from power transmission. Among them, the problem of starting of impedance relays for line protection, paralleling of transformers with dissimilar zero phase sequences impedances, rated rupturing capacity rating of switchgear and accurate operation of impedance relays in systems with multiple earthed neutrals.

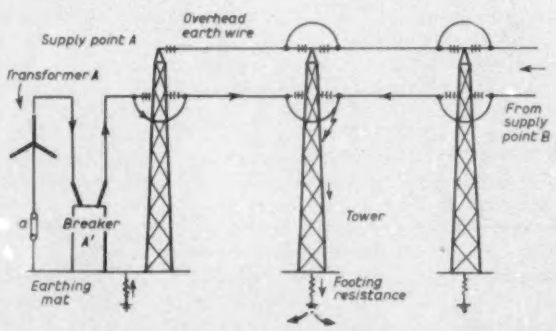


Fig. 8. Earthing arrangement for station A if the overhead earth wire is insulated

REFERENCES

1. A. Salzmann: Load division of distribution transformers with dissimilar zero phase sequence impedances analysed by symmetrical components. Electrical Energy, April, 1957.
2. M. S. Lantz: Effect of fault resistance on ground fault current. Power, Apparatus and Systems. A.I.E.E. October 1953, p. 1016.

EUROPEAN COMMON FREQUENCY

MUCH of Western Europe operates its electricity supply network in parallel through the co-ordinating activities of UCPTE, the Union for the Co-ordination of the Generation and Transmission of Electric Power. A recent report from that organisation reviews the extent of common-frequency operation at the beginning of the present year. Austria, Belgium, Federal Germany, France, Luxembourg and Switzerland were involved, with a total generating capacity in parallel totalling 39,000 MW in October last. Early in 1960 the total power supplied by the parallel systems reached 47,000 MW.

The report details the power-frequency control arrangements in the various countries, naming the stations that are used to regulate frequency. Extensive telemetering connections are used to provide the necessary speed of communication, and there has been extensive measurement of the power-frequency characteristic of the interconnected systems. For example, the present report notes that the Belgian supply system has a power-frequency characteristic of 400 MW/c/s, while for the Netherlands system the average figure is 600 MW/c/s.

Amongst the special equipment noted in the report is an electronic frequency controller at the German Schwandorf station (a steam station) which acts on boiler and turbine simultaneously. This equipment is said to increase the regulating capacity of the 100 MW machine with which it is associated. All in all, the various organisations which make up the German interconnected system dispose 1,660 MW in stations available for frequency control. In France the overall figures are 2,140 MW hydro and 2,165 MW thermal.

Arrangements are well advanced for including Italy in the common frequency connection.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Cables from Japan

IT is with regret, but not with surprise, that we hear from the BoT that the Japanese are to be given a substantial quota on electric cables for entry into the UK market. This is given, we understand, under the declared policy for liberalisation of trade.

This, we feel, is but one of the logical answers to common prices as a direct result of price leadership. The other most important answer would appear to be in the BEPC president's address to the Convention, on the changes foreseen in the design of power cables as a whole.

Referring again to foreign entry into the UK market; we hope that for the benefit of users and consumers as a whole, the goods will be in those ranges where competition is virtually non-existent. Otherwise the operation will have been an economic, as well as political, failure.

The operation, however, is not illogical if the BoT decides to allow the industry to compete with the Americans in Japan on equal terms. Like the West Germans, we feel the Japanese have a preference for the purchase of highly technical cable designs within the sterling area.

W. L. Wray,
MANAGING DIRECTOR, WANDLESIDE CABLE WORKS LTD.,
LONDON, S.W.18.

Retail Margins and R.P.M.

YOUR reference to my debate with Mr Friday at Birmingham displays a tendency for defenders of resale price maintenance to clutch at any straw that may appear to blow their way. My "admission" that margins of branded goods might be lower than margins of free-price goods has, as I explained to the audience, precious little to do with resale price maintenance.

In general, price maintenance applies to branded goods that are heavily advertised and it is the advertising that might be expected to lead to reduced margins, not the fact of RPM. To quote from an earlier publication of the Institute of Economic Affairs, *Advertising in a Free Society*, ". . . advertising to the consumer can be an alternative to generous retailers' margins." We gave examples where this applied:

"Although the makers of rival hair perms raised their retail margins to help sell their brands, the margins on Toni were left unchanged; evidently consumer advertising was found to do the job better. Beecham went further and reduced the retail margins on Maclean's toothpaste when they increased their advertising, and the retail margins on Kleenex were kept low at the outset to help pay for advertising to the consumer."

Part of the case against RPM is that it prevents the retailer passing on the economies in distribution that may result from effective consumer advertising.

R. Harris,
INSTITUTE OF ECONOMIC AFFAIRS,
LONDON S.W.1

Windsor Street Lighting

AT the request of the Civic Trust, I prepared the original design, specification of installation, and estimate for the Windsor project (*Readers' Views*, 1 June).

Unfortunately it is the manufacturers who have achieved most publicity. Personally, I was only too pleased to see that my recommendations went ahead, although in a lesser degree than intended. My design would have ensured full compliance with the proposed new Code of Practice.

It is worth noting that whereas the "hue, saturation and chroma" soon fade away, in such civic ventures the lighting is the most permanent feature—in my humble opinion, money well spent.

I specified m.i.c.c. cable for the Windsor project, but it is worth while noting that the Code of Practice by the street lighting erection contractors states that "for wall bracket lighting use heavy gauge galvanised conduit." Also ragbolts for bracket fixing! The Rawlbolt and Durium tipped drill have no say in the matter. Perhaps the job must be made to look difficult.

To conclude, I say let us have many more of these inconspicuous lighting schemes; despite the groans of the lamp column salesman and publicity angles, there are plenty of needy sites for lamp columns and plenty more where they can be dispersed in good order.

D. Clark, DIP.M.I.E.S.,
NORWICH.

Earthing to Water Pipes

WITH reference to the recent correspondence on earthing to water pipes, I hope that the time is not far distant when the IEE will state that in new installations the consumer's earthing shall consist of a connection to the earth clamp provided by the local electricity board. In Fife the electricity board are most helpful, fitting a clamp to the service cable for connection of the consumer's earth and, in the case of an overhead supply, bringing in an overhead earth wire for domestic supplies.

Water supply boards should be left alone, and all existing connections to water pipes removed. Carrying out such an operation would provide a grand opportunity for testing older installations and revealing those which are in need of rewiring.

J. H. Robinson,
GLENROTHES, FIFE.

"Off-peak" Complacency

WE read week by week in the ELECTRICAL TIMES and other publications of the growing popularity of underfloor heating. It seems that the "gimmick" days are now over, and that underfloor heating has been recognised as having a place in the world of today and in the future.

Consequently, after their early amusement, heating engineers are now taking a serious view of "off-peak" as a whole. So much so, that one large firm in the Midlands have engaged an electrician, with a view to investigating the possibilities of carrying out underfloor heating themselves.

True, one electrician does not make an installation, but is this a pointer? Are we, in the electrical contracting industry, not just a little complacent?

It would be interesting to learn whether anyone else has any knowledge of a similar venture on the part of heating engineers and, also, by what means the contractors intend to meet a serious challenge should it ever mature.

G. Jones,
LEICESTER.

Testing airliner components

NEW B.O.A.C. FACILITIES AT LONDON AIRPORT

ONE of the penalties of operating an airline over international routes is that one cannot afford to be nationally minded. If successful competition against the airlines of other countries is to be maintained, only the best and most economic aircraft must be used, regardless of the country of origin. It is for this reason that the BOAC fleet includes British Comets and Britannias, American B707s and DC7Cs, and is preparing to take into service the first VC10s when they are available in about two years' time.

With London Airport as its main base, it is clear that BOAC is in a favoured position to establish close co-operation with British component manufacturers in servicing the equipment, but is less favourably placed in regard to American equipment. With small electrical components, a partial solution is the maintenance of a high spares level, apart from the fact that many of the American producers have already set up subsidiary companies in the U.K. for the manufacture and repair of their accessories. With the larger units, such as compressors for air-conditioning, compressed air starters, constant speed drives for aircraft generators, etc., the problem is more complex. To return components to the States for overhaul would cost over £20,000 per annum for the present fleet of American aircraft, apart from carrying a much larger level of spares. To ask British manufacturers to set up testing facilities would have meant that they would have to expend capital. The BOAC has, therefore, set up its own test facilities at London Airport.

Test Equipment

Designed primarily to test pressurisation and compressed air starting components, the principle requirement is a constant supply of high-pressure air, which may be needed at high temperature and low moisture content. This is supplied by a bank of five Howden rotary screw-type compressors in the ground floor of the building, coupled to 3·3 kV Laurence, Scott squirrel-cage motors of 380 to 550 h.p. The compressors give a flow up to 300 lb/min at pressures up to 18 atmospheres (265 lb/sq in.). The motors are started direct-on-line, the larger ones being three-speed units on pole changing techniques. To remove the moisture from the air it is cooled by passing through a UDE refrigeration plant, the condensed moisture bled off and, for those conditions requiring high-temperature air, it is then passed through an AEI heating chamber with a load of 1 MW regulated by a Ferranti induction regulator. There are two of these units installed.

In five cells adjacent to the engine room are the test rigs, three of which are set up for testing air-powered components and one for alternator drives, the remaining one being held in readiness for future requirements, such as the mechanically driven compressors of the VC10. Control of the equipment and measurements are centred at desks on the first floor overlooking the cells through glass windows. On the same floor are the supervisory controls for the compressors and valves centred in a mimic diagram panel which enables single, two or three stages of compression to be utilised and diverted to any one of the cells. Protective devices include the usual overload relays and, in the case of the heaters, over-temperature and loss-of-flow protection. The heating elements in the air-heaters are mineral embedded.

The unit for testing alternator drives has two 250 h.p. motors, with Ward-Leonard control, coupled to the constant speed drives or alternators through David Brown speed increasing gears. For rectified, frequency-wild systems, such as are used on the Britannia, semi-conductor rectifiers are installed on the control room level with remotely controlled load banks for dissipating the generated energy.

The total load on the mains from the supply board's 11 kV system for the new laboratories is 4½ MW, roughly equivalent to the whole of the load due to the rest of the BOAC headquarters and shops at London Airport.

Left, general view of the compressor house at the new BOAC testing laboratories, London Airport, with, on the right, the control room that overlooks test cells situated to the right of the compressors

NOTES ON WIRING

BY MEGOHM

THE report from the Electricity Council, summarised in the ELECTRICAL TIMES of 22 June, 1961, made interesting reading, in particular in its reference to inadequate number of sockets in houses. It appears to me that all attempts to enlighten the housing planners have come to nought. At many trade conferences and conventions this matter has been one of the main talking points. It is always agreed that there is a real need for the modern house to be better provided with sockets than the older houses had been. The mere fact that new labour-saving devices are readily available adds weight to this recommendation. Yet, once again, the facts are placed before us and, no doubt, everyone will nod their head in agreement and nothing will happen.

However, we must remember that the cost of installations are rising and public authorities are attempting to keep costs down and I, for one, feel that theirs is not a happy job. But there is a limit, as far as the electrical side is concerned, where such economy can be taken to, and the word "safety" comes into the mind. Lack of sockets in the beginning invites the use of extension leads to portable apparatus, "fixed" appliances served from handy connection points and all the additions that follow.

Flexible Cable

In my Notes on 18 May, 1961, I mentioned a new flexible cable which had the conductors insulated with butyl rubber and finished in a manner which made it particularly suitable for connecting to immersion heaters. The conductors were much more flexible than the asbestos-covered cable normally used in such situations. At that time, the new cable was made in one size only, but it has proved so successful that the range of sizes has been much extended.

I was given a sample of this cable to fit on my heater and found it very much easier to install than the asbestos-covered flexible. It is also much easier to fix in position out of the way in the rather confined area of the cupboard which houses my hot tank. This fact is important in itself because of the danger to the cables by being pulled or pushed around by people placing clothing and other articles in such a convenient place for airing or drying. I found this cable much more willing to lay in the knockout of the switch than the asbestos type and altogether feel that this new cable should prove a boon to contractors. Although I have only mentioned its use on immersion heaters, there are many other situations where it could be applied to good advantage.

Indicator Lamps

I return to this subject because of a letter printed in our *Readers' Views* columns on 22 June, 1961, which, generally, agreed with my previous remarks and asked why I suggested it was not always desirable to use neon indicating lamps. May I say at once that I, in turn, agree with the writer of the letter on his point that neon lamps give the best all-round service? The point about it not being desirable to use neon lamps in certain situations is really answered in the letter, for I had in mind the lack of illumination from a neon lamp.

Of course, when we speak of "indicating" lamps we must remember that many panels, such as those used in controlling the apparatus for oil-fired boilers, have such lamps fitted. Also, such panels have lamps which indicate fault conditions (not necessarily *electrical* faults, but faults such as stoppage of oil flow, etc.) which must attract the attention of the person in charge of the plant. They are often supplemented by an audible warning, but it is the lamp which tells the attendant what is wrong. Obviously, a neon lamp would not do this efficiently, so a filament lamp is used. I also agree that lack of proper heat dissipation is a major fault in many tungsten indicator lamp units and, therefore, it is interesting to see that a double filament lamp is now available which, at the very least, will assist in this rather vexing problem. And it *is* a problem, for much may depend on whether a particular indicating lamp operates or not.

"Plaster-depth" Boxes

My opinions on the use of "plaster-depth" outlet boxes were asked for recently during a spot of refreshment. Normally, such a question would have been treated as normal conversation, but this time I felt that there was more behind the mention of these boxes. Try as I would, I could not get a satisfactory answer to the reasons for the question, which centred round the use of $\frac{3}{4}$ in. deep boxes for socket-outlets, especially the 13 A type wired on the ring-circuit principle.

This type of box has been developed over the last few years to reduce the cutting away of the now familiar thin partition walls. Cable and accessories manufacturers, together with conduit manufacturers, have assisted in its development and I have heard much praise in its favour. I have used them successfully with m.i.c.c. cable, the whole installation being installed on the surface of brick walls and ceilings *before* plastering. The only trouble was that the plasterers "skimped" their work and did not comply with instructions that "the plaster shall be not less than $\frac{3}{4}$ in. thick." Sockets used with such boxes are specially designed and project slightly from the wall to allow space in the box for the cable ends. I have seen some bodged installations which had the box sunk further back in the wall and ordinary flat-plate sockets installed, but then there are people who enjoy making life awkward for themselves.

Now then, what is behind all this? Is there an attempt afoot to discard the plaster-depth box for socket-outlets, or even to discourage its use entirely? I feel that such a move might well be taking place. If this is so, then we must discourage the architect and the builder from using thin wall bricks, hollow pots and patent partitions, must we not? In my personal opinion, the argument cuts both ways. Cut a deep box into certain of the thin brick partitions and the fixing of the box becomes a problem. I know only too well that many people rely on fixing a box by slapping cement round it, but that is not my idea of a fixing.

I shall watch and see if this matter develops further, and I'm quite sure there are many engineers who have their own opinions on the matter.

A washer under test in the soundproof cubicle

Making the Keymatic

HOOVER'S £2 MILLION PROJECT

COMPLEX automated washing machines such as Hoover's Keymatic call for entirely new concepts of production in order to meet competitive market conditions. Production lines for this new washer have required special planning with a view to speed, efficiency and quality output. No less than three miles of intricate conveyor belts ensure speedy handling with minimum effort. The washers are raised, lowered and even turned around by hydraulic lifts, all part of this £2 million plant. Keymatic's revolutionary design made it impossible to develop production from existing models. The only component common to the new washer and its predecessor is the rear pair of castors.

Automated Plant

These new methods are carried right down to the earliest stages where the sheet steel is treated in a "Drawcote" plant. This is a process in which a lubricating compound is coated on the metal to assist deep drawing in later stages. The unit, specially imported from America, is said to be the only one of its kind in use in this country. Both halves of the inner perforated tub and the outer tub are drawn on four main 200-ton press lines. Outer casings are made in an adjacent press shop.

Complex multi-spot welding is required before metal finishing processes, and the Keymatic's complicated design requires no less than six special purpose spot welders for the tub alone. The vast metal finishing bay is one continuous line of outer casings passing through electrostatic paint-spraying booths, and inner tubs travelling through a porcelain enamel baking oven.

In normal washing machine production the frame is first built up and the assembly put into it. With the Keymatic the converse occurs because most of the major operations on the tub are carried out on the underside. These tubs are assembled on a specially designed pallet in an inverted position, they are then hydraulically turned over on a mechanism designed by Hoover and placed on another pallet. Thus the 130 lb load is handled with ease.

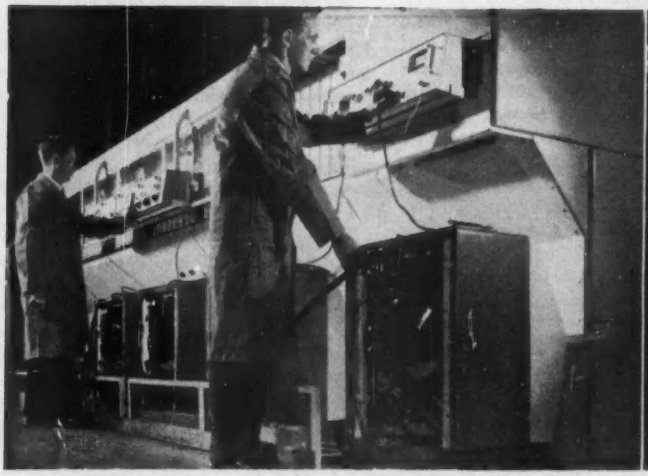
Inspection Points

All along the production line are a series of inspection points where the sub-assemblies are tested before passing to the next section. One of these, a water leakage test, is carried out early in tub assembly to ensure minimum work loss if faults occur. The tub, once assembled, is suspended in an outer shell. From here the concept of the finished article takes shape. A "Holzer" programming unit and a complexity of wiring harness are fitted into place; pumping gear and motor are screwed down.

Finally, before being passed to the warehouse, assembled machines are subjected to stringent examination on a most comprehensive test line. This section includes equipment to ensure correct operation of the automatic filling device, a feature of the Keymatic.

Here also the programming units undergo a series of accelerated tests by the use of special wooden keyplates and each machine is passed through a soundproof cubicle to trace excessive noise in operation and check drivewheel revolutions. Before packaging, external hosing is assembled and the washers are then conveyed to the warehouse.

Early autumn will see the advent of the Keymatic on the Continent and other overseas markets where it is expected to find favour. The company are also considering the prospect of exporting to America but this presents price problems to bring them into direct competition with US automatic washers.



Finished Keymatics are subjected to examination on the test line

Two-men teams working on tub assembly

Personalities *in the industry*

Mr K. J. Fulton

Mr R. W. Flux

Mr H. G. Nelson

Mr D. I. S. Hinton

Mr R. G. Spencer

The new chairman of Santon Ltd. is **Mr K. J. Fulton.** He succeeds the late Mr R. C. Taylor. Mr Fulton has been a director for 20 years and, during his 36 years with the company, has served as outside representative, London office manager, and, ultimately, commercial director at their Newport headquarters. Mr K. J. Fulton's father, the late Mr J. F. Fulton, was one of the founder directors, and chairman from 1921 to 1930. The name "Santon," by the way, was derived from parts of the names of the two founder directors—Mr H. C. Sanders and Mr Fulton.

Following his recent retirement as Director of Electrical Engineering at the Admiralty, **Sir Hamish MacLaren,** K.B.E., C.B., D.F.C., M.I.E.E., has accepted a position as consultant to the management of Yarrow and Co. Ltd.

Mr R. W. Flux, A.M.C.T., M.I.E.E., has joined the board of Bruce Peebles and Co. Ltd. He has been with the company since 1952, initially as chief engineer of the Transformer Department. Subsequently he was manager of that department and, latterly, divisional director, Transformer Division. Prior to 1952 he was transformer engineer, Transmission Design Dept. at the headquarters of the BEA for four years, having previously been transformer engineer, Technical and Research Dept., with the CEB from 1946 to 1948. He gained early training with Metropolitan-Vickers Electrical Co. and from 1937 to 1946 served in their Transformer Design Department.

Managing director of the English Electric Co. Ltd. since 1956, **Mr H. G. Nelson,** M.A.(CANTAB.), M.I.C.E., M.I.E.E., M.I.MECH.E., has been appointed a director of the Bank of England in place of Lord Cromer, who succeeds Lord Cobbold as Governor of the Bank on 1 July. Mr Nelson, who is 44 years of age, has also been industrial leader and vice-chairman of the Government's Advisory Council on Middle East Trade for the past two years, in addition to serving on many national scientific and industrial bodies.

Contracts manager to Calidec Ltd., **Mr Norman Kendall** has been appointed to the board of directors.

Managing director of Elcontrol Ltd. since its inception in 1948, **Mr E. R. Thomas** has retired from full-time executive duties and has accordingly resigned as managing director, but he remains a director and retains his financial interest in the company. His successor as managing director is **Mr B. A. Worswick,** B.SC., A.INST.P., who has been chief engineer and technical director for the past 18 months.

A new division of Associated Electrical Industries Ltd. has been formed to manage the company's Home District offices, with **Mr V. S. Risoe,** M.B.E., B.SC., M.I.E.E., as general manager of the division. He will take up full-time duty on 1 Aug. Since 1959 he has been on the board of First Electric Corporation of South Africa Ltd., from which post he is resigning. After taking his engineering degree at University College, London, in 1933, Mr Risoe went to Malaya where he spent a year on outside construction work after which he began his student apprenticeship with the BTH Co., Rugby. He joined the commercial staff in 1937 and was posted to the Madras office of AEI (India) Private Ltd. in January, 1939. During the war he was seconded to the Supply Department of the Government of India and, in 1942, was appointed Director of Electrical Engineering. Returning to AEI (India) Ltd. in 1946, he became manager of Calcutta office, being appointed to the board of the Associated Electrical Industries Manufacturing Co. Private Ltd. in Calcutta in 1952. During his time in Calcutta, Mr Risoe was chairman of the India Committee of BEAMA for two years, and was also chairman of the Calcutta branch of the IEE for a similar period. In December, 1956, he returned to England, when he was appointed to the board of Associated Electrical Industries Overseas Ltd., from which position he is also resigning to take up his new post.

British Insulated Callender's Cables Ltd. announce the appointment of **Mr D. I. S. Hinton,** B.A. (MECH. SCIENCE) as sales manager of BICC-Burndy Ltd., Prescot. He was educated at Merchant Taylors' School and Emmanuel College, Cambridge, and after taking his degree in 1953, served a one-year post-graduate apprenticeship with Vickers-Armstrong Ltd. at Weybridge. In 1954 he joined BICC as sales engineer (aircraft) and after four years in this position was appointed divisional sales manager (rubber cables). In March, 1959, he was appointed divisional sales manager at Leigh Works, and a year later he joined BICC-Burndy Ltd.

Mr R. G. Spencer has been appointed sales manager of Schick Inc. (UK) Ltd. He has had many years' experience of the shaver field, having been with the Remington Electric Shaver Co. as field sales manager, and lately combining specialist shaver wholesaling with the wholesale distribution of Unic battery shavers in the Midlands, Wales and Lincolnshire.

Newly appointed assistant manager of the Small Industrial Machines Engineering Department, Birmingham, of AEI Motor and Control Gear Division, is **Mr A. T. Stretton,** A.M.I.MECH.E., A.M.I.E.E., who started with BTH as an engineer apprentice in 1923. Five years later he entered the AC Engineering Department and was concerned with the

**Denotes revision to the "Electricity Supply Handbook, 1961."*

mechanical design of alternators, a.c. motors, f.h.p. motors, FLP motors, etc. In 1940 he was temporarily transferred as assistant to superintendent, Tool and Press Department, taking complete charge of the manufacture of magnetic torpedo pistols. A year later he returned to AC Engineering Department and worked on the design of electrical equipment for aircraft. In 1946 Mr Stretton became senior mechanical design engineer in Motor Engineering and Small Industrial Machines Engineering Department. He worked on the mechanical design and application of several types of a.c. motors, particular projects being early work with the Atomic Energy Commission at Risley and, later, on special nuclear energy compressor drives and operating motors for Berkeley. Since 1960 when SIM Engineering Department was transferred there, he has been employed at the AEI Birmingham works. He is the BEAMA representative on the BSI Committee for national and international standardisation of ball and roller bearings.

From the London Electricity Board we hear of the appointment of two assistant accountants—**Mr J. E. Bourn,** for North East London, and **Mr S. W. Pither** transferring from South East to North West London, both with effect from 1 July (*ESH, page 78).

Mr D. D. Prenn has been appointed chairman of Radio and Television Trust in succession to **Mr K. R. Cork,** who remains the financial adviser and a member of the Board. **Mr Frank S. Law** has been appointed a director.

To mark his official retirement at the end of this month, **Mr F. Bent,** M.I.E.E., A.M.I.MECH.E., district manager at Aylesbury to the Eastern Electricity Board, was recently presented with a radio set by **Mr M. E. Gall,** A.M.I.E.E., district engineer, on behalf of the staff.

The board of directors of International Systems Control Ltd., the new concern jointly formed by GEC and Thompson Ramo Wooldridge Inc., of USA (to which we refer on page 1048), comprises **Mr O. W. Humphreys,** C.B.E., B.SC., M.I.E.E., F.INST.P., F.R.AE.S., as chairman; **Dr D. N. Truscott,** O.B.E., A.C.G.I., D.I.C., B.SC., PH.D., M.I.E.E., as managing director; **Dr E. M. Grabbe,** as deputy managing director; and three additional directors, **Mr G. W. Fenimore, Mr W. A. C. Maskell,** B.SC.(ENG.), M.I.E.E., F.B.I.M., SEN.M.I.R.E., and **Mr M. E. Mohr.** Mr Humphreys is technical director of the GEC, and director of the Hirst Research Centre at Wembley. He was appointed to the GEC board in 1953 and, in 1959, was made director for research and technical development. Dr Truscott was formerly general manager of the Electronics Division, GEC, Telecommunications Group, and, earlier, was manager of the Brown's La laboratories of the GEC at Coventry. Dr Grabbe is vice-president and a director of Compagnié Europeene d'Automatisme Electronique, and was previously senior staff consultant on automation for Thompson Ramo Wooldridge Inc. since 1958. Mr Fenimore is vice-president of the latter company and of Thompson Ramo Wooldridge International. Mr Maskell is managing director of the GEC Telecommunications Group and is also Governor of the newly created Lanchester College of Advanced Technology, at Coventry. He started at the Coventry Telephone works as a graduate apprentice in 1925. Mr Mohr is vice-president and general manager of the Electronic and Systems Group of Thompson Ramo Wooldridge.

Mr A. M. Browne, president of BEAMA, right, presenting a transistor radio set on behalf of the association to Sir Josiah Eccles to mark his service to the industry. Sir Josiah retires from the Electricity Council at the end of July. The presentation was made at the BEAMA Council luncheon last Thursday

Mr J. A. Knowles has recently taken up a position on the sales staff of Brook Motors Ltd. at their Bristol office. He has been with the company for 12 years.

Mr H. R. Brooker has joined the board of Johnson, Matthey and Co. Ltd. as a joint managing director of the company. He has hitherto been general sales manager and will continue to be principally responsible for all the sales divisions of the company.

The business of the Digital Engineering Co. Ltd. was recently taken over, at their own request, by Allen West and Co. Ltd.; and **Dr L. N. Bramley,** PH.D.(ENG.), M.SC.(ENG.), A.C.G.I., D.I.C., M.I.E.E., has entered into an agreement to continue as managing director of the former company.

Production director of Geo. Salter and Co. Ltd., **Mr P. P. C. Drabble** is leaving the company towards the end of next month and intends to devote himself entirely to a literary career, in which field he has already achieved some success.

In a reorganisation of the board of Metrix Instruments Ltd., **Mr M. A. Fry,** managing director of the Electronic Rentals group, becomes chairman. **Mr P. S. Chaves,** founder director of Metrix, is managing director. **Mr A. Olorenshaw** has resigned from the company. **Mr A. F. Moulton** and **Mr L. F. Odell,** O.B.E. (of ER) and **Mr E. W. Fry** complete the board.

Mr T. W. Haycroft, A.M.I.MAR.E., has been appointed assistant education manager—craft apprenticeships, at Associated Electrical Industries Ltd., Trafford Park. He joined Metropolitan-

Mr O. W. Humphreys

Dr D. N. Truscott

Dr E. M. Grabbe

Mr G. W. Fenimore

Vickers Electrical Co. in 1953 as an instructor in the Apprentice Training School and, in 1955, was made responsible as an apprentice supervisor for the training of machine shop and toolmaking apprentices in the various manufacturing departments. He returned to the Apprentice Training School as the senior instructor in 1958, and became chief assistant in charge of the Works School (boys) and the factory training of all craft apprentices in 1959. Mr Haycroft represents industry as a member of the Council of the Union of Lancashire and Cheshire Institutes and also serves on a number of Education and Engineering Advisory Committees. He recently represented AEI on a panel which was formed to compile the syllabus for the new General Course (Engineering).

Mr J. L. Thompson, general manager and director of Square D Ltd. has now been appointed managing director. He has been general manager of the company since its inception in November, 1955, and became a director in 1958. **Mr D. Gemmell,** A.M.I.E.E., executive director of Square D Ltd., has been appointed general manager of the Company's Swindon establishment. He heads the firm's engineering and manufacturing divisions, and has been executive director for the past year. **Mr R. G. Camp,** A.S.M.A., who has also been with the company since its inception, and became sales manager in August, 1959, is now appointed executive director. Mr Thompson and Mr Camp will be based on the company's new executive headquarters in Park La, London.

The name of the new works manager of Ultra Electronics Ltd., to whom we referred on 15 June, is **Mr E. B. Augood,** and not as we stated.

Mr J. Clinkskell has been appointed London sales manager to BKB Electric Motors Ltd. He was previously electrical sales manager for Export and Technical Services Ltd., the export agents for BKB. He will be responsible for sales in London and the Home Counties and takes up his new post on 1 July.

Formerly regional sales manager with Automatic Telephone and Electric Co. Ltd., **Mr H. Cooper** has joined the AEI Telecommunications Division as sales manager, Telecommunication Transmission Department. Before going to ATE in 1951 he served in the Post Office engineer-in-chief's office in London.

Mr G. L. Hanns, branch manager at Hatherleigh since 1940, was recently presented with a transistor radio set and a cheque subscribed for by friends and colleagues in the South West Electricity Board's area to mark his retirement. The presentation was made by Mr T. G. Ward, district engineer. After war service, Mr Hanns began his career with the Horrabridge and District Electric Supply Co. in 1920 as company engineer, running turbines, distribution, and consumer service. In 1931, when the West Devon Electric Supply Co. was formed, he continued at Horrabridge as branch manager and moved to Hatherleigh in 1940.

OBITUARY

Mr A. F. Woodward, a director of Alan Woodward Ltd., of Oxford, has died as the result of a road accident, aged 49.

Mr K. C. Lawley, secretary of the National Federated Electrical Association and assistant secretary of the Electrical Contractors' Association and the NECTA Ltd. since June, 1959, died on 21 June, aged 48. He had been in poor health for some months previously. Mr Lawley joined the Association in July, 1943, as principal assistant to the director. Although he was concerned with all aspects of the Association's work, he specialised latterly on contractural affairs, insurance (of which he had a very wide experience) and industrial relations. He was held in high esteem both among members and in other sections of the electrical industry. He also represented the NECTA Ltd. on the National Chamber of Trade and the NFEA on the Specialist Trades Holiday Scheme Ltd.

Mr K. C. Lawley

I.E.E. Awards

THE Council of the Institution of Electrical Engineers have made the following award of Premiums for papers read or accepted for publication during the year 1960:

Group A.—*The Kelvin Premium* (*value £25*) to **Prof F. C. Williams,** O.B.E., D.SC., D.PHIL., F.R.S., **E. R. Laithwaite,** M.SC., PH.D., **J. F. Eastham,** M.SC., **L. S. Piggott,** M.SC.(ENG.), and **W. Farrer,** M.SC. *The John Hopkinson Premium* (*value £25*) to **F. Kift.**

Group B. Electronics and Communications Section Premiums.—*The Ambrose Fleming Premium* (*value £15*) to **R. F. Cleaver,** M.SC.(ENG.), **P. Sothcott,** B.SC., and **Group Capt F. J. Robinson,** O.B.E., D.F.C. *Premiums* (*value £10 each*) to **P. J. B. Clarricoats,** B.SC.(ENG.), PH.D., **G. V. Geiger,** B.SC., **N. D. La Frenais,** B.SC.(ENG.), **W. J. Lucas,** M.SC., **W. Hersch,** PH.D., B.SC.(ENG.), **L. R. F. Harris,** M.A., **V. E. Mann, P. W. Ward,** B.SC.(ENG.), **R. G. Knight,** B.SC.(ENG.), **A. D. Martin, E. A. R. Peddle,** B.SC., **B. D. Simmons, H. H. Adelaar, A. Salle, F. A. Clemens, J. Masure, J. van Goethem** (of Antwerp), and **S. Cornbleet,** B.SC.

Measurement and Control Section Premiums.—*The Mather Premium* (*value £15*) to **B. J. Davies,** B.SC.(ENG.), **R. C. Robbins,** B.A., **C. Wallis,** B.SC., and **R. W. Wilde,** B.SC. *Premiums* (*value £10 each*) to **E. H. Cooke-Yarborough,** M.A., **R. C. M. Barnes,** B.SC.(ENG.), **R. M. Huey,** B.SC., B.E., **O. Pawloff,** DIPL.ING., **T. Glucharoff,** DIPL.ING., M.E., **Prof T. Kilburn,** M.A., D.SC., PH.D., **D. B. G. Edwards,** PH.D., M.SC., **D. Aspinall,** M.SC., **L. R. Blake,** PH.D., B.SC., **J. L. Douce,** PH.D., M.SC., **B. G. Leary,** B.E., **Prof J. C. West,** PH.D., D.SC., and **R. E. King,** PH.D., M.SC., B.SC.

Supply Section Premiums.—*The Sebastian de Ferranti Premium* (*value £20*) to **L. Gosland,** B.SC., **R. G. Parr,** B.SC.(ENG.), and **G. S. Buckingham,** B.SC.(ENG.). *The John Snell Premium* (*value £15*) to **E. C. Rogers,** M.SC., and **D. J. Skipper,** B.SC.(ENG.). *Premiums* (*value £10*) to **E. H. Cox,** and **R. E. Martin,** D.F.H.

Utilisation Section Premiums.—*The Crompton Premium* (*value £20*) to **W. R. Stevens,** B.SC., and **H. M. Ferguson.** *The Swan Premium* (*value £15*) to **K. F. Bacon.** *Premium* (*value £10*) to **J. P. McBreen.**

Group C.—*The Frank Gill Premium* (*value £15*) to **R. L. Grimsdale,** M.SC., PH.D., and **P. H. Sinclare,** M.SC. *The Heaviside Premium* (*value £15*) to **R. G. Medhurst,** B.SC. *Oversea Premium for Senior Members* (*value £15*) to **D. Broadbent,** B.SC., M.ENG.SC., PH.D., and **K. N. Stanton,** B.E. (of NSW).

The Coopers Hill War Memorial Prize and Medal for 1961 (*value approx. £20*) is awarded to **A. E. Karbowiak,** PH.D., B.SC.(ENG.), for his paper on "Microwave Aspects of Waveguides for Long-Distance Transmission."

Graduate and Student Premiums.—*Premiums* (*value £10 each*) to **K. I. Bartlett,** B.SC.(ENG.), **J. D. Edwards** and **A. C. Hall.** *The Henry Nimmo Premium* (*value £10*) to **R. Hawley,** B.SC., and *Premiums* (*value £5*) to **P. J. Bennett, J. B. Edwards,** B.SC.(ENG.), **R. E. Hayes,** M.SC., PH.D., **P. Richardson,** B.SC., **T. J. Roberts,** B.SC., and **K. von Krogh.**

Air-cooled condensate at Rugeley

120 MW PLANT NEARS COMPLETION

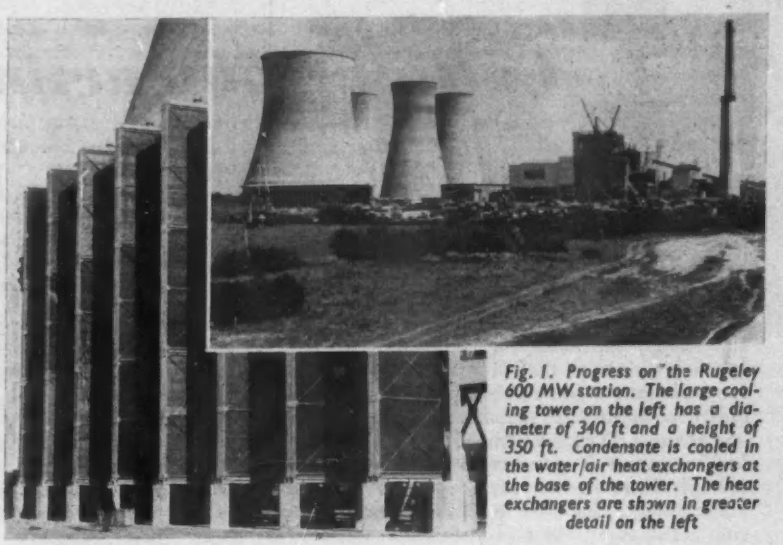


Fig. 1. Progress on the Rugeley 600 MW station. The large cooling tower on the left has a diameter of 340 ft and a height of 350 ft. Condensate is cooled in the water/air heat exchangers at the base of the tower. The heat exchangers are shown in greater detail on the left

CIRCULATING water will not be needed for the condensers on one of the five 120 MW sets now under construction for Rugeley power station. Instead, heat will be extracted from the condensate by water/air heat exchangers mounted round the base perimeter of an hyperbolic cooling tower.

The condensate cooling plant, the first installation of its size, will be experimental and is now nearing completion. Originally developed for small plants in Hungary, the scheme has been developed by English Electric for sets rated up to 500 MW and the CEGB have taken the initiative with the first large installation in the world.

Costs, and the performance of the Heller system, as it is named, in relation to conventional condensing plant will determine whether it will be adopted for other stations, but the system has potentially several clear advantages. Ideally, station sites must be in close proximity to both fuel and abundant water supplies; the dry cooling tower can remove this second constraint. The system also reduces the likelihood of condensate becoming contaminated by leakage through condenser tubing as can occur in the surface condenser, and a spray condenser can be used which requires less turbine basement volume, with consequent reduction in civil construction costs.

The principle of the Heller system is shown in Fig. 2. Condensate is drawn from the spray condenser by an extraction pump and passed either back to the boiler feed system or to the cooling tower heat exchangers. Natural draught created by the tower extracts heat from the condensate, which then flows back to be used for spray condensing.

On the return path to the spray condenser, energy possessed by the condensate resulting from the hydraulic head of the heat exchanger and, to some extent, the condenser vacuum, is utilised in a Francis turbine which assists the extraction pump driving motor. In this way, about 90% of the excess head is usefully employed.

Heat Exchanger Construction

Efficient operation of the equipment turns on the effectiveness of the water/air heat exchanger and considerable development work has been put into this part of the plant. The exchanger unit is made of aluminium and consists of rows of slotted aluminium strips threaded on to tubes. The strips are spaced by collars, and effective heat transfer between strip and tube is ensured by expanding the tube until the strip is tightly held. The tubes are also expanded into the headers. For the Rugeley tower, each column of heat exchangers consists of three units, giving a total height of 48 ft. Each unit consists of 240 tubes in eight rows and measures 8 ft by 6 in.

Pressurised System

In the closed condensate system contamination is unlikely, and air leakage into the system is prevented by the pressure which exists in the heat exchanger circuit between the extraction pump and water turbine.

The spray condenser eliminates temperature drop associated with the tubes of a surface type, enabling a slightly higher vacuum to be achieved. This type of condenser also occupies less volume than the surface type. Cooled condensate from the water turbine flows along ducts in the condenser shell and is admitted through nozzles which direct the cooled water against the steam flow. Water returned from auxiliaries is also injected into the condenser through another set of nozzles.

The cooling tower for the experimental system has a similar height to the conventional wet cooling towers at the station, but is larger in diameter. No cooling pond is required beneath the tower. The first of the five 120 MW sets to be installed at Rugeley (M) was commissioned in January this year. The sets are being built by C. A. Parsons and the boilers by Babcock and Wilcox.

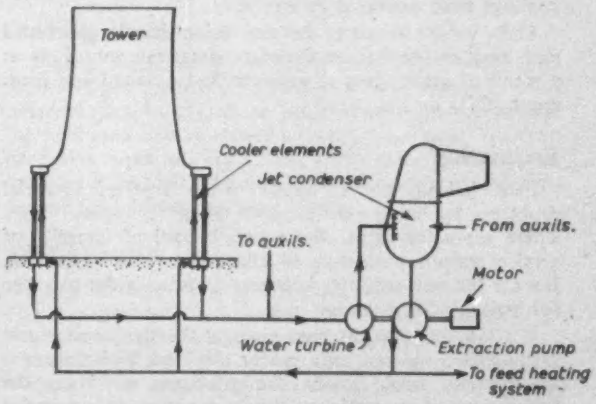


Fig. 2. Simplified diagram of the 120 MW set cooling system which uses water/air heat exchangers and a spray condenser

Cutting contracting costs

POINTS TO WATCH ON AND OFF SITE

by M. Neidle, Graduate I.E.E.

THE "good old days" of the pre-war period holds few happy memories for contractors, since it conjures up visions of that £1-a-point, cut-throat competition for what little work which was available. In spite of full order books, the fact remains that electrical wiring is still one of the most highly competitive of all industries. Therefore, whilst it is possible to show the way to definite savings, there is no royal road to increased profits. Unremitting endeavours in all fields are necessary for any contracting firm to be ahead of their rivals.

Taking it for granted that the contractor has enough capital to finance his organisation, and sufficient acumen and experience to cope with the purely business side, in such a technical industry all will still be lost unless he has an intimate grasp of electrical principles. The basis of his work requires an encyclopaedic grasp of the IEE Wiring Regulations, since any new ideas of the go-ahead must comply with these regulations. Nor must this technical knowledge remain static, as it is essential to keep abreast with all new developments.

The first contractor to have the courage and foresight to use the 13 A ring-circuit on a wide scale must have had an immense advantage, particularly if, after its use in domestic situations, he was able to see how its diversity feature could apply to the commercial sphere and use of small tools. At the present moment there is a famine of standard water-heaters. Curiously, however, the high loading, quick-heating types are more readily available. The contractor must be in the position to advise his customer on their reliability and suitability. Again, are the rustless and other positive features of plastics trunking sufficient to overcome objections to it? The first to successfully exploit the advantages of the 8 ft, 85 W fluorescent tube will have a similar advantage.

It is easy, however, to fall into a trap and consider that all new applications, when they are highly advertised, are necessarily sound without a critical survey of their suitability. Examples are not lacking where unexpected shortcomings have appeared in service.

Thus, we are forced to the conclusion that the successful man must realise that continued progress can only come as a result of great effort in order to find a sound and fresh approach.

Estimating

Few, indeed, are fortunate to be free of financial problems by being able to work on a "cost-plus" basis. There are some firms whose long record of integrity of service permits customers to allow this form of costing, but for the vast majority keenness of price is the privilege for remaining in business.

If a low estimate has been given at the start, no amount of manoeuvring can make up for this loss. Whilst there is an excellent book[1] giving the principles governing the submitting of quotations, the numerous unforeseeable factors militate against estimating ever becoming an exact science when applied to electrical contracting. No doubt every estimator has his own method, and each firm its own figures for "man-hour" constants based on carefully analysed records, but all paper systems must be firmly guided by practical experience to answer the many questions and counter-questions. For instance, where there is a choice of wiring systems—are mineral-insulated cables always preferable to screwed conduit? Or will a compromise with trunking effect that extra economy? Plastics or t.r.s. cables?

Since the "rise and fall" clause is falling into disuse, it behoves the wary estimator to *anticipate* price trends by regularly studying the metal markets and assiduously reading the appropriate company reports. While it is a truism that the person responsible for purchases must "buy right" (which is not synonymous with being the cheapest), he must continually press for favourable terms; even if it means breaking away from old, tried and trusted factors.

A common allowance for wastage is 10%, and this figure is certainly not too high, judging from the amount of material one sees left behind on building sites. As a result of strict organisational control to eliminate waste, a cut to 5% would make a considerable increase in the profit margin.

Where alterations or rewiring occur, an alert foreman or chargehand will see that the firm's empty van on its return journey is loaded with useless cable and obsolete switchgear. This can be sold as scrap, thus further reducing the amount usually written off as waste.

Site Organisation

The most typical aspect of electrical installation work is its service "in the field." Probably in no other way can the fresh approach be fruitfully applied than in improved organisation. On site, this implies ultra-careful planning in order that labour and materials are dovetailed in to fit in with other trades. This is, of course, the key to rapid working, with its consequent rich rewards. A miscalculation here will almost certainly result in losses. If the plasterer covers the walls before the electrician has installed his conduits a treble setback is incurred through (a) additional cutting away; and (b) "contra-charges" for making good; or (c) even more serious, the building contractor may demand payment to cover the "penalty clause," alleging delays caused by the electrical work. On the larger buildings, this can be avoided by the representative of the electrical contractor forcibly pressing his point that early knowledge of the building programme is essential for harmonious relations and progress. On the basis of this information the electrical site foreman will have to enlarge or deplete his staff accordingly.

Labour

In effect, the contractor is now somewhat similar to a general commanding his army, who must move his men in position in order to achieve clearly defined objectives.

Certainly, a great deal of money will be lost if the work is not carried out when required. Labour relations is a thorny problem, but no success can be obtained unless the men are imbued with some enthusiasm for the project. How far incentives can go to win the human factor, in this most exacting of all trades, can only be worked out carefully in each case.

To be really ahead, the drive against waste would have to be matched by the aim to cut out unnecessary items sometimes euphemistically classified under "Overheads." On the other hand, it would be a mistake to simply see this in terms of slashing reductions. It might even be necessary to make an increase in capital expenditure through the purchase of labour-saving devices. The point is that such purchases should not be haphazard, but only as a result of careful survey and analysis.

Checking

Once the confidence of labour has been gained to accept reasonable time schedules for wiring operations, it must be followed by a continuous check on broad lines which must correspond to the actual situation. A warning note must be given against being bogged down by too many details on paper—these "paper victories" too often end in financial losses. On this basis, if there is a proper understanding, assistance can then be given where there are genuine reasons for not reaching agreed targets. Simple progress charts on site, so that the operatives can see the actual development of the job, are also a further means for achieving co-operation. An office block chart could be on the lines shown in Fig. 1.

Thus, at a glance it can be seen, for example, that the top two floors are completely tubed and wired, in addition to the fifth floor being tubed only, and rooms 1 to 6 on the fourth floor and rooms 1 to 5 on the third floor. The method can easily be adapted to industrial and other installations.

Table 1. Power Tools and Accessories

Basic operations	Adaptations
Drilling ..	Wood bit, masonry drill, core-cutter (for concrete). Wood and metal bits with serrated sides.
Sawing ..	Circular saw, jigsaw.
Chiselling ..	"Kango" type using electric hammer with "combs" and chisel bits. Thin carburundum wheels.

Labour-saving Devices

The proposed Budget "payroll" tax has followed a series of wage increases and has lent emphasis to the vital need to conserve labour, the price of which appears to be continually increasing in proportion to the cost of materials. However, the many different operations of the electricians' trade do not allow it to be classed under the category of "automation" or "mass-production," but the electric drill and its adaptations can easily form the basis of many economy devices. Some mention has been made in a previous article,[2] but the discerning organiser has an almost unlimited choice of fitments. Table 1 gives some ideas.

Even if there is no supply available, ex-Government service generators can be readily purchased from surplus contractors at a reasonable cost. For £40 to £60 a 4 kW to 5 kW size can be obtained, which is ample for the tools which are likely to be used and gives a spare for lighting and some heating. With strict organisation, the amount of saving in non-productive preparatory work by the use of such a unit is considerable, even by the employment of simple tools such as the electric drill, with its sharp wood bit for drilling joists, and the electric hammer for wall chases and general plugging.

One wonders why some enterprising firm has not offered such a hire service for country sites at, say, housing estates, which consist largely of repetition work involving a great deal of cutting away and other heavy labour.

Off-site Work

A common conclusion to discussion by installation engineers is the enormous increase in wiring work which could be achieved were the operations not carried out in such difficult conditions, or not bedevilled by other trades.

Although installations are "tailor-made" to suit the exigencies of the building fabric, the alert contractor will arrange as much as possible of the work to be carried out under improved supervision and controlled conditions to nearly approach the techniques of factory production.

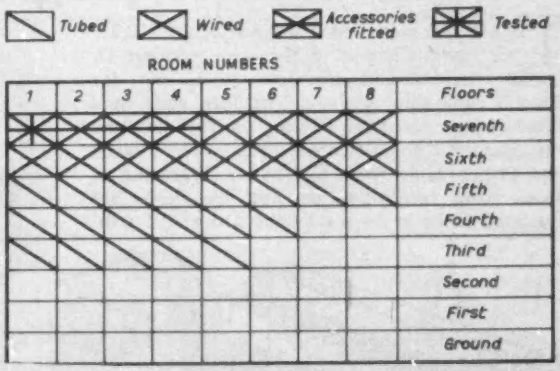


Fig. 1. Progress chart for wiring work on an office block

The more obvious examples occur where there is any chance of "replica" work such as occurs in blocks of flats. Already, manufacturers will quote extremely keenly for prefabricated mineral-insulated cables complete with seals and glands and thus only require laying in place with greatly reduced labour. There is also plenty of flexibility in the use of these cables, since they are supplied in "random lengths," i.e., somewhat longer than required—the surplus length allowing for rerouting should difficulties occur.

Jobbing Work

Jobbing work, surely, requires a technique on its own since it is the reverse of repetition work; every job, being different, can be placed on an extremely paying basis if the right men, courteous and efficient, are selected for these particular types of job. These employees, by and large, must work on their own initiative and must welcome hints to ease their labours and save time.

13 A Circuits

Many of these immediate savings revolve round the use of the ubiquitous 13 A socket. Just a few suggestions to illustrate this point may be seen as follows:

A common inquiry concerns the possibility of looping from a 15 A socket-outlet at the fireplace, as the only skirting point in the room, to a lighting socket positioned at the opposite wall. This, of course, infringes IEE Regula-

tions, although it is not always easy to convince customers the reason why it actually does break safety rules. One answer to this problem is to replace the point at the fireplace with a 13 A socket-outlet and continue with 7/·029 cable to another 13 A socket-outlet at the light position, taking care to insert a 2 A fuse in the plug. The 15 A circuit fuse should also be replaced with a 20 A size to comply with Regulation 114, Table C(a).

Where three socket-outlets, not in one room, are required to be wired, it would be advisable to ask the customer to pay for having these points wired in 7/·036 size cable. This allows all three to be looped and permits a margin for the possibility of three further looped points. If more are required at a later stage, the cable run can easily be converted to a ring-circuit.

Two existing 15 A points, if wired with 7/·029 cable, can be used as the two legs of a ring for 13 A conversion, but extreme care is necessary to see that they are in a really sound condition. It is these particular leads which carry the main current of the ring-circuit.

In cases where the grid overhead wiring system is used, economy can often be gained by specifying a single multiple cable for a ring-circuit comprising four cores and an earth and with appropriate tapping points for the 13 A sockets. Unfortunately, this scheme cannot easily be extended to suit m.i.c.c. cables.

Service

Since the electrical contractor does not manufacture anything, service is his *raison d'être*. The principle of sound service is all too often forgotten in the scramble to meet day-to-day questions. The contractor who is able to prevent himself from being overwhelmed by these pressing problems and can clearly keep this aim in view will win rich rewards.

REFERENCES

1. *Electrical Contracting*, by H. R. Taunton (book). Pitman.
2. "Care in Domestic Wiring," ELECTRICAL TIMES, 16 February, 1961.

Channel cable progress

THE British and French sections of the 200 kV d.c. cross-Channel cable were successfully joined in mid-Channel last week by the French cable-ship *Ampere*. The four ends were lifted and prepared for jointing on Thursday and the operation completed on Friday. The French and British cables were laid by the beginning of June. After completion of tests, the cables are expected to be in service by the end of the year.

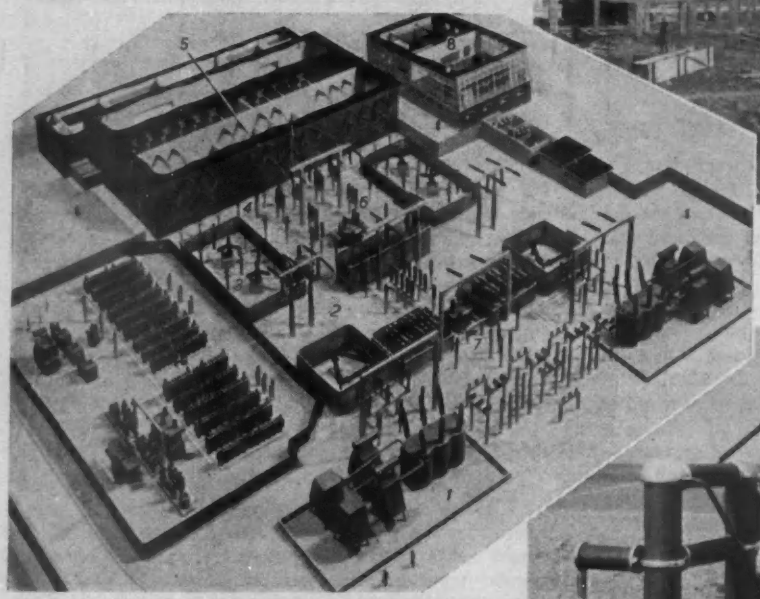


Fig. 1. This model of the Lydd converter station shows how the completed station will appear. Most of the converting equipment has been made by ASEA of Sweden, but the converter transformers were built by Fuller Electric. 1—converter transformers; 2—surge diverters; 3—converter valve damping equipment; 4—voltage measuring dividers; 5—converter station; 6—d.c. smoothing reactor; 7—harmonic damping reactor, damping capacitors and cable terminations; 8—control room

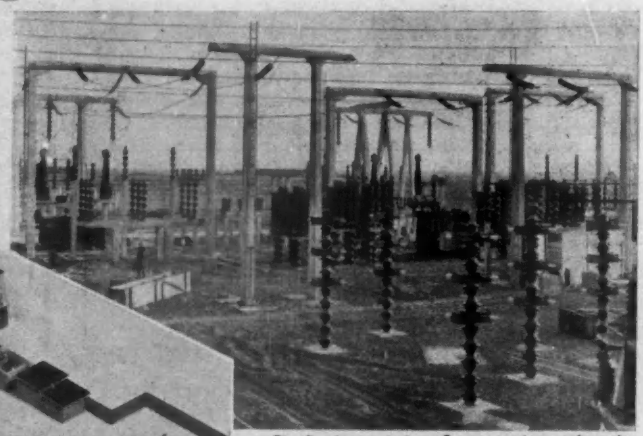


Fig. 3. A recent view of construction work on the Lydd converter station as seen from the control room site. In the foreground is one of the two converter valve damping equipments and in the background the reactor and capacitor banks for harmonic suppression can be seen

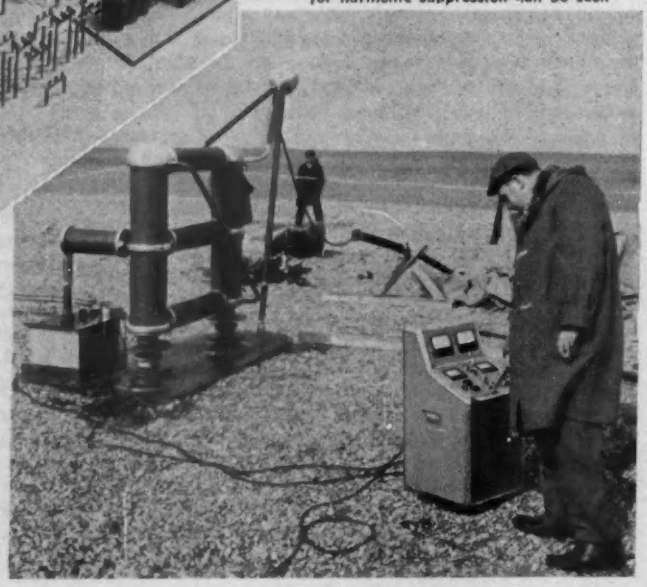
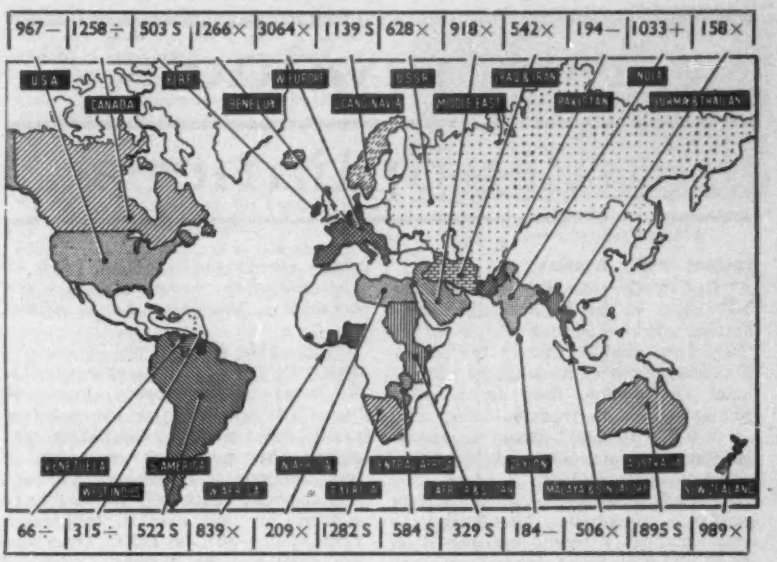


Fig. 2. Portable high-voltage equipment in use for testing one of the British submarine cables ▶

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures.



EXPORTS
IMPORTS
May

NEARLY £500,000 down in value on the figure for April, exports of electrical goods last month, at £24,443,281, were about the average for the year so far. Exports of f.h.p. motors reached a high total, of which £208,353 related to those not exceeding one-third h.p. Transformer exports were slightly down for the month, with those of over 7,500 kVA amounting to £479,759. In the switchgear sphere, the major contribution—worth £1,316,480—was for types of over 660 V, 200 A.

Turning to domestic appliances, sharp reductions were suffered for cookers, space heaters, dryers and refrigerators, but a happier state of affairs is shown in the rise of exports of washing machines and vacuum cleaners, although total figures are again nearly £200,000 down for the month.

The best market again proved to be Australia, who took goods to a value of £1,895,983, of which £541,509 related to heavy plant, £79,278 to cables, and £160,047 to electronic and radio equipment. But the continuing growth of the western Europe market will be noted —over £500,000 up for the month, while the USSR showed its usual sudden spurt on the export of special equipment. Further increases too, were achieved in the Middle East.

The total value of imports, at £5,579,600, was the highest of the year, with increases for motors, switchgear, radio and electronic equipment, washing machines and lighting fittings.

Description	Exports Value (£)		Imports Value (£)	
	May 1960	May 1961	May 1960	May 1961
Generators				
Diesel up to 200 kW	326,134	267,633		
Diesel over 200 kW	87,969	342,641		
Steam turbine driven	35,913	7,265		
Water and gas turbines	597,141	847,107	99,052	78,924
With i.c. and other prime movers	71,937	61,266		
Generators up to 200 kW	83,032	122,192		
Generators over 200 kW	70,645	8,207		
Generator parts	1,480,024	646,546		
Motors, f.h.p.	304,038	305,053		
Motors 1-250 h.p.	556,919	435,717	203,686	269,516
Other motors	342,760	250,968		
Motor starters and controllers	230,852	279,777		
Convertors and rectifiers	81,006	190,059	101,394	166,521
Transformers	648,241	828,494		
Switchgear, to 200A, mv	333,718	503,488	176,106	209,817
Switchgear, other	908,338	1,316,480		
Total, Electrical Plant	*6,248,677*	*6,412,891*	*580,238*	*724,778*
Batteries, primary and parts	585,590	608,452		
Lamps filament, over 28 V	115,293	89,584		
Lamps filament, under 28 V	25,808	30,250	86,046	89,679
Fluorescent tubular lamps	86,263	85,705		
Other lamps and parts	82,913	100,633		
Radio and electronic gear	3,651,716	4,565,048	1,350,727	1,524,208
Telephone and telegraphic equipment	1,877,586	1,876,149	69,639	62,319
Cookers	48,795	29,170		
Other cooking appliances and parts	152,585	139,439		
Space heaters	20,922	13,422	164,881	246,144
Water heaters	31,333	36,509		
Other heaters and parts	123,205	122,643		
Electric irons	71,067	75,989		
Vacuum cleaners	179,343	296,216		
Floor polishers	68,056	39,831	134,922	181,959
Food mixers	61,370	74,272		
Washing machines, domestic	668,662	649,602	122,681	112,281
Dryers	30,867	17,801		
Washing machine and dryer parts	81,568	178,195	122,681	112,281
Domestic refrigerators and parts	904,955	666,995	962,106	181,785
Other appliances and parts	416,313	358,534		
Total, Domestic Appliances	*2,859,041*	*2,698,618*	*1,384,590*	*722,169*
Portable power tools	246,846	295,519		
Arc welding plant	89,883	89,553	61,022	113,665
Resistance welding plant	25,139	34,677		
Electric furnaces	196,291	102,635		
Signalling apparatus	77,352	120,108		
Commercial instruments	217,454	192,006	79,628	119,411
House service meters	140,560	135,022		
Wiring accessories	235,389	214,852		
Fans	104,211	125,325		
Lighting fittings and lanterns	336,453	345,660	146,215	153,850
Other lighting equipment	76,114	85,856		
Telephone and telegraph cable	272,455	406,749		
Paper insulated cables	500,902	476,768		
Rubber insulated cables	268,826	242,338		
Thermoplastic insulated cables	424,453	362,824		
Winding and similar wires	126,452	138,440		
Other cables and wires	203,139	196,546		
Total, all cables and wires	*1,796,227*	*1,823,665*		
Accumulators and parts	325,523	372,154		
Insulating materials	223,100	162,413		
Industrial electronic control gear	147,474	213,743	67,682	88,179
Electrical ware	140,413	136,834		
Permanent magnets	75,884	67,117		
All other articles	3,068,190	3,458,809	1,888,157	1,981,342
Total	23,053,380	24,443,281	5,713,944	5,579,600

new products and appliances

Instant water heaters

GROWING interest seems to be taken in the instantaneous water heaters, and two current models are the "Jack Daw" and "Infrasol." The former is manufactured in Birmingham and the latter at Croydon. Both are basically similar in design, loadings being rated at 3 kW. "Infrasol" has a maximum temperature range of 150°F—160°F which is controlled by a water pressure regulator acting in the same manner as a thermostat. The heater can only function if water pressure is at 18 lb p.s.i., this being necessary to complete the circuit. It sells at £13 10s. Slightly cheaper at £12 16s 6d, the "Jack Daw" J.3 is unaffected by variations in water pressure and is said to operate satisfactorily with pressures upwards of 4 lb p.s.i. This heater with an element life said to be about eight to ten years, incorporates a thermostat and pressure release valve for safety. Performance is said to be about 1pt/min at 100°C and six pints at blood heat (35°C). *Jack Daw Productions Ltd., Lower Essex St, Birmingham. Grimwood (Croydon) Ltd., 59/65 Cross Rd, East Croydon.*

Digital read-out projector

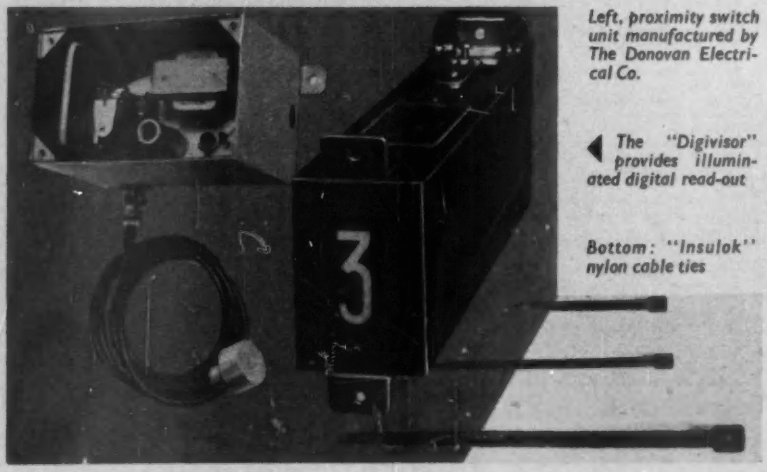
DESIGNATED the "Digivisor," a new device provides illuminated digital read-out direct from electronic counters, computers and similar equipment, without the need for intermediate amplification. The design incorporates a miniature moving-coil unit carrying a microfilm, which is interposed between a 6 V projection lamp and a viewing screen. By this means figures printed on the film can be projected to give a ¼ in. high image. Dimensions of the "Digivisor" are 1¾ in. by 1¼ in. by 6 in. *The Electrical Apparatus Co., New Barnes Ave, Mile House La, St. Albans.*

Nylon cable ties

PROVIDING a neat alternative to metal straps, recently introduced "Insulok" cable ties are fabricated in nylon and feature a self-locking cam device. They possess the advantage of being resistant to atmospheric corrosion and chemical attack and are said to be suitable for use over a temperature range from −80°C to 150°C. Three sizes are available for binding groups of cables from $\frac{5}{16}$ in. dia up to 2 in. dia overall; for larger diameters up to three ties may be linked together. Prices range from 12s to £1 16s a gross. *Insuloid Manufacturing Co. Ltd., Sharston Wks, Leestone Rd, Wythenshawe.*

Industrial proximity switch

ORIGINALLY developed for the motor industry and now being manufactured for general applications, a limit switch is operated by the close proximity of any flat metal surface to an inductive sensing head. The switch unit, to which the sensing head is connected via a flexible coaxial cable, is housed in a sheet-metal box and comprises a mains-powered thermionic valve and relay circuit. The relay, which is fitted with two changeover contacts, is rated at 5 A, 250 V, and power consumption of the whole unit is 6 W at either 250 V or 400 V a.c. Maximum frequency of operation of the device is five times/sec, with a repetitive accuracy of actuating position said to be within 0·02 in. *The Donovan Electrical Co. Ltd., Granville St, Birmingham 1.*



Left, proximity switch unit manufactured by The Donovan Electrical Co.

◀ *The "Digivisor" provides illuminated digital read-out*

Bottom: "Insulok" nylon cable ties

EE bring back washer

IN response to renewed demand, English Electric have reinstated in their home laundry equipment the model 4007 washing machine. It is an agitator type machine with 9 lb capacity and is fitted with a 3 kW heating element. It is now available in white, equipped with power wringer and stainless steel tub. The price is set at £72 6s 3d. *English Electric Co. Ltd., English Electric Hse, Strand, W.C.2.*

Earthing rods price cut

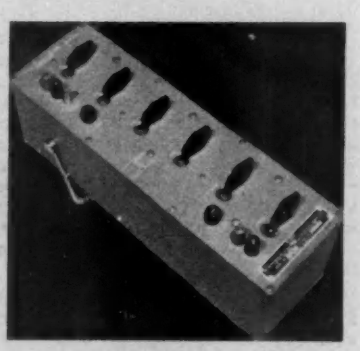
A REDUCTION of approximately 15% in the price of their Copperweld earthing rods is announced by Chilton Electric. The price of these rods is now said to be on a par with the plain copper type on the market. Advantage claimed for Copperweld rods is high conductivity combined with rigidity, enabling deep driving and thus low earthing resistance. Prices of Chilton accessories remain unchanged. *Chilton Electric Products Ltd., Hungerford, Berks.*

Switchless fluorescent fittings

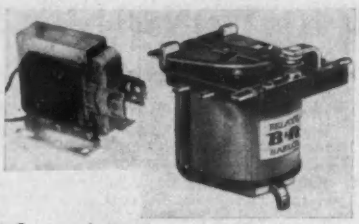
A NEW switchless model has been added to the Ekco-Ensign "Super Slim" range of fluorescent lighting fittings. Called the "Slickstart" these fittings are for 230 V to 240 V only. They are said to provide easy starting and eliminate switch replacement. Fittings are available in 80 W, 5 ft, and 40 W, 4 ft, sizes and cost 7s 8d and 7s 7d more than the list prices. *Ekco-Ensign Electric Ltd., Vigo St, W.1.*

Precision ratio transformers

PROVIDING accurate standards for a.c. bridge, potentiometer and similar electrical measurements, voltage ratio transformers made by Gertsch Products Inc. of America are now available. There are two types, the "RT4" and "RT5" covering frequency ranges 30-1,000 c/s and 50-10,000 c/s respectively. Ratios are selected by operating five decade switches and a potentiometer, ratio accuracies of 0·001% being said to be possible for lower frequencies and 0·01% at the upper frequency limit. Units are available for rack mounting or with cast-aluminium cases. *Wayne Kerr Laboratories Ltd., 44 Coombe Rd, New Malden, Surrey.*



Gertsch Products ratio transformer for precision measurements



Left, one of the "Soreng" range of solenoids for domestic appliances
Right, B and R miniature d.c. relay

Miniature d.c. relay

HAVING dimensions of only 1 in. by ⅝ in. by 1 13/32 in., the recently introduced "B.14" d.c. operated relay is smallest of the B and R range. It has a single set of changeover type contacts having its common terminal connected to the relay frame. Contacts are either silver or silver/cadmium faced, with a gap of 0·015 in. Nominal coil consumption is rated at 100 mW giving a relay operating time of 3 millisec. *B and R Relays Ltd., Temple Fields, Harlow, Essex.*

Solenoids for appliance control

BY agreement with the Controls Company of America, a British company, Westool Ltd., is to manufacture the "Soreng" range of solenoids. It is announced that these components will soon be available in quantity for a wide range of applications in domestic appliances, automobiles, vending machines and similar equipment. *Westool Ltd., St. Helen's Auckland, Co. Durham.*

Remote control colour TV camera

FEATURING remote control, a new camera for colour TV, besides giving increased versatility in broadcasting, is expected to extend industrial applications of closed-circuit TV. The camera employs three "Vidicon" tubes and a novel optical system said to be capable of producing high-quality pictures under poor lighting conditions. It will work on 405, 525 or 625 line standards and pictures can be displayed either on a 21 in. receiver or else projected on to an 18 ft by 12 ft screen. Remote control facilities include those for tilting, focus and lens changing. Housed in a dust-proof casing, a typical application is in viewing melt conditions inside a steel furnace. *EMI Electronics Ltd., Hayes, Middx.*

Transistorised logic system

RECENTLY introduced are fully encapsulated versions of "Minilog" logic elements for industrial control and sequencing applications. These are transistorised solid-state devices replacing mechanical relays and stepping switches to ensure trouble-free operation under extreme environmental conditions. Two types of element are available, both having dimensions 2 in. by 0·85 in. by 0·63 in. One has provision for six inputs driving up to five outputs; the other incorporates an emitter follower and can drive up to 25 outputs. Up to 48 "Minilog" elements can be mounted on 12 in. by 17 in. circuit boards, 12 of which can be accommodated on a special chassis. Inter-circuit connections are provided by means of gold-plated plugs and sockets. *Elliott-Automation Ltd., 34 Portland Pl, W.1.*

German-designed refrigerator

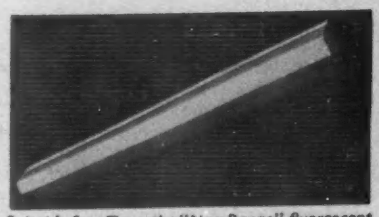
BETTER known for their home laundry equipment, the German firm of Scharpf have launched a 3 cu ft refrigerator, although it is not their first venture into the domestic 'fridge market. This model is compact, has clean lines and a well-designed interior. It has full-width freezing compartment and chiller tray for storing fish. Suitable for standard a.c. voltages this compressor type unit, called "Fridgemaster," has a stove-enamelled exterior with vitreous enamel table-top. Its dimensions are 33 in. high, 19½ in. wide and 21 in. deep. It sells at 48 gn including tax. Distributors: *Denham and Morley Ltd., Denmore Hse, Cleveland St, W.1.*

Sealed miniature relay

SUITABLE for control and telecommunications applications, a new miniature moving-coil relay, the "Microtat," comprises a shock-mounted moving-coil carrying a single contact which engages with fixed contacts at either end of the arc of travel. The whole is hermetically sealed in a cylindrical metal container, 20 mm in diameter and 40 mm long. Available with full-scale deflection sensitivities of 50μA, 250μA or 2·5 mA, operating time of the relay varies between 0·1 sec and 0·5 sec, depending on type and contact setting. Relays are supplied with the moving contact zeroed in the central position or else making with one or other of the fixed contacts. Maximum power handling capacity of the contacts is 30 mW at 20 V a.c. or d.c. *Leland Instruments Ltd., 145 Grosvenor Rd, S.W.1.*

Attractive diffusers

PARTICULARLY suited for use in shops, stores and offices is a range of totally enclosed diffusers by Crompton Parkinson. Dished end plates in red, cerulean blue or primrose are fitted over the ends of the standard 4 ft and 5 ft "New Range" batten fittings. The diffuser itself is of reeded opal plastic and abuts against the side of the batten impeding collection of dust and insects. They are available for use with one or two lamp battens which may have snap or switch start control gear. *Crompton Parkinson Ltd., Crompton Hse, Aldwych, W.C.2.*



Suitable for offices, the "New Range" fluorescent fitting from Crompton Parkinson

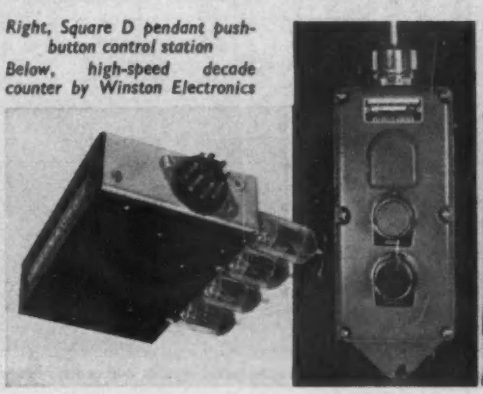
Pendant control units

FEATURING oil- and dust-proof construction, a range of pendant control station units is announced suitable for arduous industrial conditions. Designated the "Class 9001, Type TYB" range, nine sizes of unit are available accommodating from two to nine push-button controls. As an alternative to a push-button, a "wobble stick" actuator can be supplied suitable for mounting on the pendant station. This is an emergency stop device consisting of a lever which will operate control contacts when pushed in any direction convenient to the operator. *Square D Ltd., Cheney Manor, Swindon, Wilts.*

High-speed visual decade counter

CONSTRUCTED as a plug-in module, a high-speed pulse-counting unit now available, gives a numerical display of counts from "0" to "9" on a translucent Perspex panel. Units can be connected in cascade as a series of decades, depending upon the total number to be counted. In operation, the tenth input pulse to any unit in the series will reset it to zero and simultaneously trigger a pulse which is recorded by the next unit. Incorporating a four-valve electronic circuit, the unit has a maximum counting rate of 40 kc/s and will accept pulses having a minimum width of 0·5 microsec and a maximum rise time of 1·5 microsec. It has dimensions 1¼ in. by 5¼ in. by 5¼ in. and is suitable for plugging in to a standard octal socket. *Winston Electronics Ltd., Shepperton, Middx.*

Right, Square D pendant push-button control station
Below, high-speed decade counter by Winston Electronics



Below, sealed miniature moving-coil relay for control and telecommunications applications by Leyland Instruments

Wringerless washer

AEI-HOTPOINT have introduced a wringerless washing machine to cater for housewives with separate spin dryers. Basically the same as the "Countess" model, it has three controls instead of four and can be conveniently stored away beneath a draining board. This machine is available in cream or white and sells at £51 9s, including purchase tax. *AEI-Hotpoint Ltd., 33 Grosvenor Pl, S.W.1.*

Falk distribute Sona percolators

UNDER a new agreement Falk are to become the sole distributors to the electrical trade of Sona coffee percolators. Constructed in aluminium, they are made by N. C. Joseph, of Stratford-on-Avon, and have ratings of 600 W. The percolator is automatic and thermostatically controlled. The price is £5 19s 6d, including tax. *Falk, Stadelmann Ltd., 91 Farringdon Rd, E.C.1.*

TRADE PUBLICATIONS

BELLING AND LEE.—Catalogue supplement for May detailing components made by Belling and Lee Ltd., Gt. Cambridge Rd, Enfield, Middx.

CAMBRIDGE.—Three leaflets detailing electro-chemical dissolved oxygen analyser, dissolved hydrogen analyser and indicating pneumatic temperature controller. Cambridge Instrument Co. Ltd., 13 Grosvenor Pl, S.W.1.

CARTER GEARS. — Brochure describing "AM" range of hydraulic stepless variable speed gears including details of latest 10 h.p. size. Carter Gears Ltd., Bradford, Yorks.

CLARKE, CHAPMAN.—Four revised catalogues on electrically driven automatic winches, hydraulic machinery, and a.c. cargo winch, by Clarke, Chapman and Co. Ltd., Victoria Wks, Gateshead 8.

D.T.V. — New catalogue and industrial handbook covering a range from a simple plug to closed circuit TV station. Direct TV Replacements Ltd., 138 Lewisham Way, S.E.14.

FIDOR.—16-page illustrated booklet describing insulating fireboards and hardboards for shopfitting contractors. Fibre Building Board Development Organisation Ltd., Stafford Hse, Norfolk St, W.C.2.

EKCO.—June price lists for lamps and tubes and projector lamps. Ekco-Ensign Ltd., Preston Hse, Essex St, Strand, W.C.2.

ENGLEHARD. — Folder containing graphs and text relating to an acid gold solution manufactured by the Baker Platinum Div. of Englehard Industries Ltd., 52 High Holborn, W.C.1.

HIGGS.—Abridged price list of squirrel-cage, slip-ring and fractional h.p. motors. Higgs Motors Ltd., Witton, Birmingham 6.

INCO-MOND.—Illustrated 22-page booklet concerning use of nickel in s.s. *Canberra*. International Nickel Co. (Mond) Ltd., Thames Hse, Millbank, S.W.1.

JOHNSON, MATTHEY.—New series of data sheets describing range of small bore tubes and tube products. Johnson, Matthey and Co. Ltd., 73-83 Hatton Gdn.

METWAY.—Catalogue of domestic appliances for the 1961-2 season from Metway Products, Kemp Town, Brighton.

New Pumping Station for Norwich

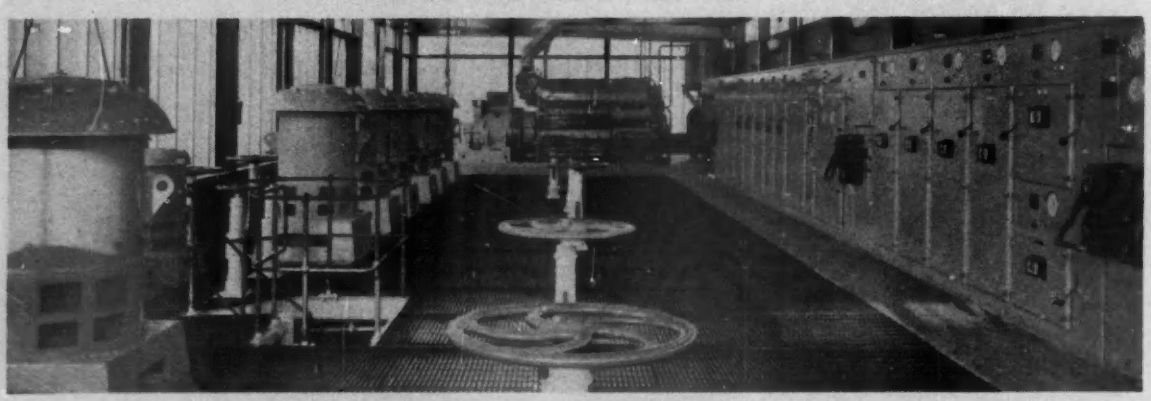
PROVIDING a peak pumping capacity of 120 million gallons/day, the new pumping station at Trowse has been built to serve Norwich city's drainage system. Its functions are twofold; that of maintaining normal drainage flow and of coping with storm-flow.

Typical of a modern installation, motive power for the station is electrical, it being equipped with a total of 11 vertical spindle, Gwynnes pumps driven by squirrel-cage motors. The latter, supplied by Laurence, Scott and Electromotors, are direct-on-line starting, working at 415 V, three-phase. To guard against damp windings, the motors have drip-proof enclosures and feature built-in heaters which switch on automatically whenever pumps become idle. Six pumps are for normal duty, each of these delivering 7,000 g.p.m. against an 81 ft head with a motor rating of 235 h.p. For storm-water duty, three 140 h.p. pumps are installed, each designed to deliver 14,500 g.p.m. against a head of 23 ft. The two pumps remaining, rated at 40 h.p., deal with the relatively slack flow occurring at night.

Optimising Running Costs

Mains supplies for the pumps are derived from two 750 kVA transformers feeding an LSE control board via Erskine Heap o.c.b's. In the event of mains failure, two 500 kVA 0·8 p.f. alternator sets driven by Lister Blackstone turbo-charged diesels, provide standby supplies. During peak pumping periods, sectionalised busbars enable the load to be shared between mains supply and standby alternator sets. The latter arrangement gives optimum running costs by cutting down maximum demand imposed on the mains supply. To effect further tariff economies, BICC capacitors have been installed, which improve p.f. of the motor load, bringing it up to 0·95. The alternators are not normally run in parallel with the mains supply and a system of interlocks has been installed to prevent this happening accidentally. Should parallel operation be required, however, the control board includes facilities for synchronising.

Drainage level is controlled by Evershed and Vignoles "No Flote" equipment which switches on pumps automatically as the level rises. The system ensures that not more than one pump is switched on at a time, thus limiting the maximum instantaneous starting load imposed on the supply. To deal with comparatively heavy starting currents of individual pump motors, the LSE standby alternators incorporate the "Altoreg" regulation system. The system, employing a magnetic amplifier, ensures rapid voltage recovery from effects of momentary overloading.



Trowse pumping station interior showing LSE vertical spindle pump motors and control board with standby diesel-alternator sets in background

POWER SUPPLY

Statistics for May

COMMISSIONING of three units during May brought the largest increase in output capacity of the CEGB since last December. Output capacity is now 27,415 MW, compared with a total for the UK of 30,208 MW. There was no change in generating capacity of the two Scottish Boards during the month. Two 120 MW sets with 860 klb/hr unit boilers were commissioned, the No. 12 unit at Skelton Grange B (Y) with a Parsons set and a Mitchell boiler and No. 4 unit at Northfleet (SE). The Northfleet set was constructed by GEC and operates in conjunction with a Foster Wheeler boiler. Commissioning of this set completes the 480 MW extension to the station. The half-way stage in commissioning has been reached with the third 100 MW set now in service at Aberthaw (SW). This set was also built by Parsons and it has a 755 klb/hr Foster Wheeler boiler.

Total output capacity of the three boards is 7% above the total for May, 1960, and electricity sent out has risen by 10·4% to a total of 9,112 million units. Total electricity generated in May was 6·4% more than the electricity sent out at 9,697 million units. Of this total, 8,996 million units was generated by the CEGB and 493 million units by the SSEB. A striking rise in generation of 30·4% by the NSHEB to 208 million units included increased exports to the SSEB of 110%, compared with May last year, to 50·5 million units. The increase in generation follows the rise in unit sales of 19·2% by the NSHEB and 17% by the SSEB. This increase, however, may be attributed to a very old cause—the weather.

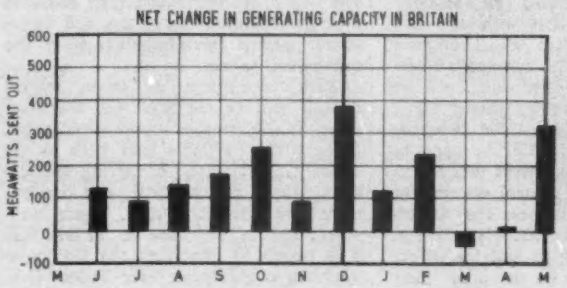
Sales increases by the area boards were less dramatic but none the less substantial at 10·7%. When electricity supplied directly by the CEGB is also taken into account, the increase for the month was 10·4% on May, 1960, and this figure reduces to 8·4% if corrections for number of working days and weather conditions are made. Highest increases occurred in the mainly non-industrial areas with a rise of 12·4% to 2,982·2 million units. Between April, 1960, and November, 1960, the corrected increase for each month, with the exception of two, remained between 12% and 13·5%. Since November, the increase has fallen fairly steadily to the 8·4% recorded for May.

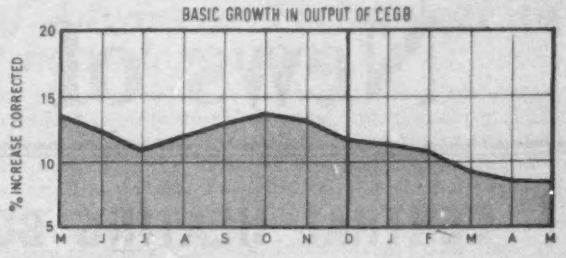
Generation outside the electricity supply system rose for the month ending 30 April by 4·6% to 1,111 million units, compared with 1960. Contributory to this increase was a rise in nuclear generation of 21% to 176 million units and a generation increase of 8% to 181 million units by the paper industry. A decline in generation was reported for some industries, notably 6·3% for textiles and leather.

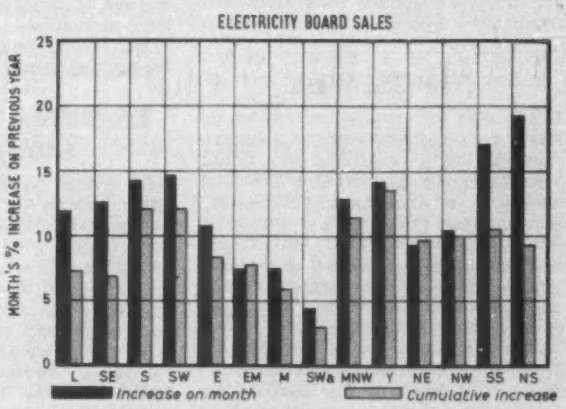
Electricity Board Sales Progress in May

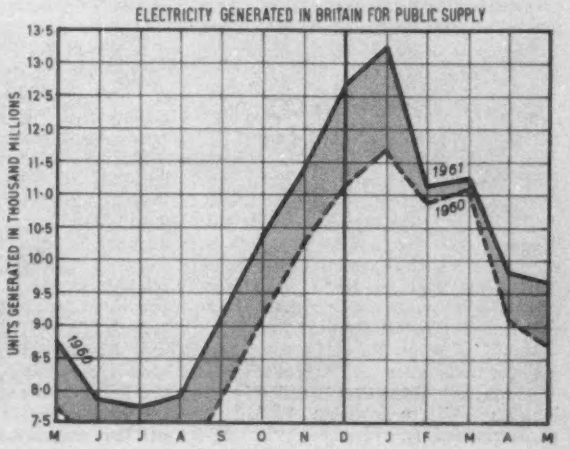
Board	Electricity sent out in millions of units	% Increase May 1960
London	683·8	11·7
South Eastern	494·6	12·5
Southern	678·3	14·1
South Western	318·1	14·7
Eastern	807·4	10·7
East Midlands	680·2	7·5
Midlands	884·8	7·5
South Wales	505·6	4·4
Merseyside and N. Wales	556·1	12·9
Yorkshire	926·9	14·1
North Eastern	517·4	9·3
North Western	896·7	10·4
Direct Supplies by CEGB	322·3	5·4
CEGB Total	8,272·2	10·4
South of Scotland	666·0	17·0
North of Scotland	145·1	19·2

Table excludes area board purchases from other sources









News of the Week

CENTRAL HEATING BOOM?

Electric panel heaters in new sales methods

ELECTRIC "central heating" seems to be coming big business. In recent months several new concerns have entered the field, offering electric heating installations in domestic premises—a sphere in which existing electrical contractor/retailers could well compete. These new firms usually offer to install panel-type radiators in most rooms, with time switch and thermostatic control, an immersion heater and, possibly, an infra-red heater in the bathroom, together with roof insulation. Installation costs are claimed to be well below those for a comparable oil- or coal-fired installation. One firm has quoted £180 for an installation including ten radiators; another, which claims to have completed 2,000 such installations, is offering a special discount on summer orders. Local advertising is usually employed to make contact with prospective clients, with salesmen following up to clinch matters.

The band is soon to be joined by the direct-sales washing machine firm, Rolls Electromatic Ltd., who are forming a special Central Heating Division. They are at present seeking to contact electricians and contractors who will undertake the installation of the heaters, some of which, the ELECTRICAL TIMES was told on Monday, may be made by Rolls Electromatic. A national publicity campaign is shortly to be launched.

New BSI Work

MILL type d.c. electric motors having frame sizes corresponding to American standards are to be covered by a British Standard now being prepared, BSI have anounced. At a later stage the committee concerned intend to give consideration to a.c. motors. They will examine whether it will be useful to standardise dimensions of electromagnetic brakes, used in conjunction with mill type motors. Electrical equipment is also involved in a planned revision of BS 1757 covering mobile cranes. The requirements for electric cables in that standard are to be reconsidered as part of a general review which will take account of recent advances in the design of mobile cranes.

ELECTRICAL SUBJECTS AT PLASTICS CONFERENCE

THE Plastics Institute will hold a conference on "Testing for Performance" on 13 March to 15 March, 1962, at IEE headquarters. The second day will be devoted to electrical aspects, when papers will be presented by Mr J. H. Mason, of AEI (Woolwich), on "Electrical Insulation—Testing for High-voltage Application," Mr K. H. Stark (EE) on "Testing and Evaluation of Plastics for use as Electrical Insulation," and Mr A. Reddish (ICI) on "Some Pitfalls in Dielectric Testing."

The Earthing Problem

THE North Eastern Electricity Board have informed local authorities in their area that, in some cases, water mains are now no longer a safe earthing system for electrical installations. The Board has offered to carry out earthing tests at a nominal fee of 5s and, where necessary, householders, etc., will have to pay the cost of providing a safe earth. Some local authorities are protesting that it is the Board's responsibility to see that the earthing system is safe.

Employers Don't Give Study Time

NOT enough employers are prepared to allow students to attend full-time day, as opposed to evening, classes in technical colleges, says the Minister of Education. Answering a Parliamentary questioner last week, he said there had also been difficulty due to the lack of interest of some young people in part-time day courses and, in some cases, through an inadequate range of courses being available. However, he saw a growing appreciation of the value of part-time day classes.

Engineering Pay Claim

THE plan for a new wage increase demand in the engineering and shipbuilding industry was approved at last week's annual conference of the Confederation of Shipbuilding and Engineering Unions. Although no actual increase figure was named, it is suggested that the most prominent unions are seeking a rise of at least £1 a week. Further discussions on the claim will be held at the Confederation's executive meeting in York on 13 July.

LARGE ORDERS

A CONTRACT valued at £1,100,000 for precipitators for four 350 MW boilers at Tilbury power station has been awarded to Lodge-Cottrell Ltd. That concern is also to supply a further five precipitators, worth £440,000, for Dorman Long's Lackenby open hearth steel furnaces.

Approximately 300 loudspeakers and two master control announcing positions have been ordered from the Westrex Co. Ltd. for the new terminal building at Kai-Tak International Airport, Hong Kong.

A £300,000 contract for electrically welded finned steel tube, for Dungeness nuclear power station, has been received by Tube Products Ltd., one of the TI group. The Expanded Surface Tube Co. is to supply 608,000 ft of 2 in. dia welded finned tube for the same project.

No Licence, No New TV?

SHOULD traders be prohibited from selling radio or TV sets unless a licence is produced by the purchaser? Lord Napier and Ettrick suggested this in a House of Lords question this week, but the reply for the Government showed little liking for the idea. It was pointed out that such a move would involve legislation requiring dealers to act as agents for the Post Office.

G.E.C. Link With U.S. Automation Firm

A NEW company, whose primary activity will be the design of process control systems for industrial processes, was incorporated on Monday by GEC in association with the Los Angeles computer firm of Thompson Ramo Wooldridge. The company, International Systems Control Ltd., will be based at GEC's Coventry factory with headquarters in London. The directors are listed on page 1037. A team of between 50 and 70 engineers will act as consultants to design control systems for specific industrial processes. The American firm have been particularly active in this field in recent years and the object of the association is to pool their knowledge with GEC resources in advanced electronic engineering.

GEC emphatically state that this new link will in no way affect their relations with International Computers and Tabulators, whose chief interest is in the commercial sphere.

Main constituent of these control systems will be the RW 300, manufactured by Thompson Ramo Wooldridge. These control systems have been in use in the United States in varying applications, such as chemical and nuclear plant and aircraft control. These computers are to be made in Britain and it is hoped to export to the Commonwealth and European Free Trade Area.

LIGHTING YOUR HOME

OVER the next few days the British Lighting Council is displaying a representative range of lighting fittings for the home in a series of domestic situations at their headquarters, 16-18 Lancaster Pl, London W.C.2. This is part of a campaign which is being launched to improve standards of home lighting, and a ten-page booklet, "Lighting Your Home," is being released which includes a method of assessing the light distribution in existing rooms without recourse to photometers and which will certainly appeal to the average housewife. A special feature of the present campaign is the introduction of fluorescent fittings into the living rooms as indirect and pelmet lighting supplemented by tungsten filament sources as table and standard lamps for local, high-level illumination. While the campaign stresses the cheapness of good lighting generally, it makes the important point that home lighting is a very personal matter. No one but the home user can say precisely what they want and it is their responsibility to think, plan and decide what is to be done. They will find some interesting ideas, however, in the demonstration rooms, one of which is pictured above.

Takeovers

EVEN though their preference dividends are 21 years in arrears, Sterling Industries Ltd.'s rejection of the first bid from the Vokes Group has resulted in a higher offer. Vokes have now made a new bid worth £1·1 million, subject to adequate acceptance on or before 7 July.

A. Reyrolle and Co. are also in the takeover news. Nalder Bros. and Thompson now becomes a wholly owned subsidiary, following total acceptance by holders of shares which Reyrolle did not already own.

Wandleside in India

ORDERS for cable machinery, valued at £75,000, to be exported from the UK have just been placed by Wandleside Cable Wks Ltd. on behalf of their associates in Poona and Bombay. The main orders have gone to GWB Furnaces Ltd., B. and F. Carter Ltd., Deco Machinery Ltd., Winget-Synchro Ltd., and Rudkin and Riley Ltd. This is the first stage of Wandleside's development in India.

Colleges of Advanced Technology to be independent

COLLEGES of Advanced Technology are to be transferred from the control of local education authorities to independent governing bodies receiving direct grants from the Ministry of Education. This was announced by the Minister, Sir David Eccles, last week when he spoke of the "remarkable progress" made by the colleges, which at present provide 14,000 places for students.

Explaining the reasons behind the move, the Minister said that the success of the colleges in developing as national institutions of higher education had raised many new problems of planning and staffing. The colleges were outgrowing the local government framework. In particular, the change would help staffing problems, because lecturers at the colleges would no longer be tied to Burnham scales.

The colleges affected are those at Birmingham, Bradford, Bristol, Salford, Cardiff and Loughborough, together with the Chelsea, Battersea and Northampton colleges administered by the London County Council. The Minister intends shortly to designate a further college in Middlesex, based on the Brunel college of Technology, Acton, which is to be moved to a new and larger site. At present, Loughborough alone has an independent governing body receiving a direct grant from the Ministry.

All work at colleges of advanced technology is now at university level, the number of part-time students is being reduced and the number of full-time and sandwich-course students has risen to about 9,000. About 3,800 students are studying for Dip.Tech., the rest for university degrees or examinations leading to qualifications of various professional bodies. Post-graduate studies and research are being expanded in all the colleges.

Running cost of the eight colleges administered by local education authorities at present is about £2¼ million with additional £½ million for loan charges. The Treasury meets about 55% of this cost. About 1,400 teachers are employed in the colleges apart from administrative staff, technicians, etc.

The whole pattern of higher education in Britain at present is being reviewed by a committee of inquiry, under the chairmanship of Lord Robbins. The present change is being made with the knowledge of the Robbins Committee, without pre-judging any recommendations the committee may make in the long-term future of colleges of advanced technology.

OFFICIAL PUBLICATIONS

Trading Opportunities in West Germany. Report of Export Council for Europe. 5s (see page 1050).

Annual Report on Alkali, etc., Works, by the Chief Inspectors, 1960. HMSO. 4s (see page 1051).

BS 3363. Schedules of Letter Symbols for Light-current Semi-conductor Devices. 5s.

S.T.C. EXPAND PRODUCTION AT PAIGNTON

TAKING another step away from the London area, Standard Telephones and Cables have now completed transfer of capacitor production from Woolwich to Paignton in Devon. The new capacitor factory has been established on the Brixham road, alongside the company's Valve Division which made a similar move a few years back. Capacitors, like valves, are key STC products, and the range manufactured at Paignton includes coated foil, oil-filled paper and tantalum electrolytic types for telecommunications and control applications. Both factories are air-conditioned with ultra-clean areas provided for assembly of components for submarine telephone repeaters.

At present employing 2,000 people and occupying a 46-acre site, further expansion is envisaged for the Paignton factories. Already an extension of 60,000 sq ft in floor area is in progress for the capacitor factory. Increased production of both telecommunications and industrial valves is planned. The factories absorb seasonal labour surpluses.

Assembly of capacitors for submarine telephone repeaters under clean conditions at the new Standard Telephones and Cables' factory, Paignton. The factory produces many types of capacitor for control and telecommunications applications

Three 40 ft Tubewright towers, each with two Mazda 1,500 W g.l.s. lamps and a 200 W sodium linear lamp, light the log pond at Michael Nairn's chipboard factory at Inverness. The lights will enable workers to handle the flow of logs 24 hours a day. Contractors were Sturrock Power Installations Ltd.

Hotpoint to cut refrigerator output

AEI-HOTPOINT LTD. have already decided to discontinue the night shift at their refrigerator factory at Peterborough from mid-August, when the factory reopens after the annual shutdown. As a result, 500 of the 2,500 employees are being given one month's notice. The production cut-back will be partly seasonal, as autumn will then be just around the corner, but the poor start to the main selling season in the market as a whole, disclosed by manufacturers' deliveries during April, has no doubt influenced AEI-Hotpoint.

Nevertheless, the company's output will probably still be of no mean order, as capacity at Peterborough has doubled during the past year.

Lower exports by refrigerator manufacturers may also be a factor in AEI-Hotpoint's decision. In April exports fell for the first time in months, and latest BoT figures show that this decline went further in May, with exports dropping to £666,995 from £904,955 a year earlier.

No other refrigerator manufacturers have reported retrenchments so far. Some say they are doing reasonably well, but confess to being somewhat uneasy about the state of the market. At AEI-Hotpoint's washing-machine factory in Llandudno, day and night shifts will continue.

FILM ON ELECTRON MICROSCOPE

"ELECTRON Microscopy" is the title of a new film produced by the AEI film unit. Aimed at a general audience possessing basic scientific knowledge, the film explains the elementary working principles of the electron microscope and illustrates its applications in industrial and medical research. An aspect of electron microscopy brought out by the film is the specialised technique required to prepare and mount specimens for examination. The film is available on loan from the AEI Film Library, Crown Hse, Aldwych.

Electrical Exporters Succeed in W. Germany

THERE must be few countries where the Government actually encourages imports, but this is the situation in West Germany at present. The country is both sitting on a mountain of money and fighting to stave off inflation. British electrical firms have done well in this market, which is described as "tremendously exciting and challenging" by the Export Council for Europe mission which Sir William McFadzean led there last month. Whereas Britain as a whole only maintained her 4·6% share of the import market in 1960, electrical goods gained on competitors in most cases. For example, UK now supplies just over half of the Federal Republic's imports of washing machines, instead of just under half, and there were much greater gains by irons and vacuum cleaners to 26% and 38% of imports, respectively. Generators, motors and electronics equipment also gained ground. This achievement is particularly encouraging when it is considered that it took place before the revaluation of the Deutschmark, which was matched by the Netherlands, who are Britain's main competitors in several types of electrical goods.

One important point is the German insistence on quality. After visiting several other countries, "pathfinder" missions said that in many cases British quality was too high. This is certainly not the case in West Germany. In this highly sophisticated market, quality and style are paramount and, as a corollary, so are service and spare parts.

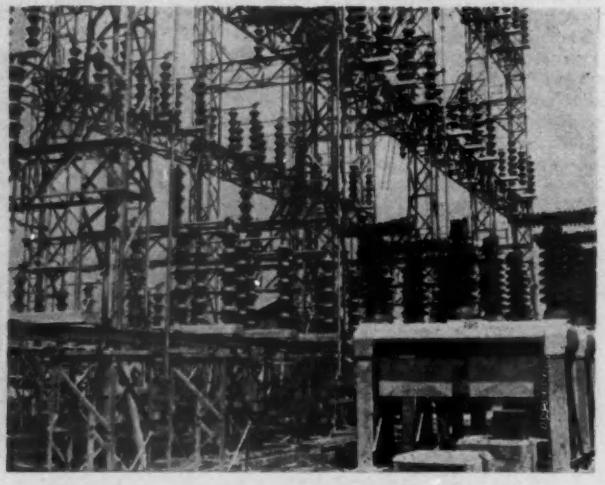
Fashion, also, is all-important, and there is an especially favourable opportunity for new exports having the feature of novelty, or which are labour saving. Designs have to appeal to German taste, but many types of imports sell simply because their style is different.

Visits by executives to get the feel of the market is strongly advocated, and use of the German language is "essential." With the possible exception of highly technical equipment, goods should be sold by Germans, even though suitable agents are becoming scarce outside of Hamburg and Bremen. In any event, technical translations should be done by Germans. Advertisements also need attention, says the report; far too often they do not appeal to German taste. For those who can stand the rigours of this market the rewards are there, for last year, Germany's imports from all sources rose by one-fifth to £310 million a month.

Display cup goes to Crediton

DEVON teams did well in SWEB's display competition for service centres this year. Crediton proved themselves no country cousins and were adjudged to have produced the best display in the whole competition. With a team comprising Mrs N. D. I. Relph, Mr T. E. Relph, Miss M. E. Vanstone and Mr F. C. Winch, they were competing in the section for smaller service centres and won the Display Challenge Cup.

Although unable to field Beau Nash on this occasion, Bath broke the Devon monopoly and won the Frank Forrest Silver Trophy for the best display among large service centres. Runners-up were Plymouth, who had hoped to complete their hat trick this year. Third place was shared by Torquay and Exeter. Presenting the awards, Mrs Frank Forrest said SWEB were installing an average of 100 cookers and 72 water heaters every working day.



The unusual three-tier isolator arrangement at the Puerto Nuevo 132 kV substation, Buenos Aires, part of a £5 million contract recently placed with AEI Ltd. which was featured in a local industrial exhibition marking Argentine's 150th anniversary of its independence

OLD STATIONS STILL CAUSE POLLUTION PROBLEMS

DIFFICULT decisions lie ahead about provision of grit and smoke elimination plant in old and small power stations warns the Chief Inspector of Alkali, etc., Works in his annual report for 1960. The Committee on Air Pollution thought that all the old stations would be closed by 1964; but the recent growth of demand has made the CEGB unwilling to retire them so quickly.

The inspector comments that the Board is "understandably reluctant" to spend much money on means for reducing grit or smoke emission or for increasing the height of chimneys at such stations, because of their limited life. On the other hand, for the short periods during the winter when such stations are steaming, "their interference with local amenities can be appreciable."

Medium-sized power stations received much attention from the inspectorate. On the whole, conditions at them improved compared with 1959, although there were complaints, some reckoned as justified, against a number of stations. The main task is to ensure that the grit arresting plant that is installed operates at full efficiency. The inspectorate has also given attention to plans for very large power stations, where high efficiency grit arrestment and chimneys of 600 ft or more are needed.

The report makes special mention of the gas-washing installations at Bankside and Battersea, which were generally satisfactory. At Battersea, however, there is conflict of opinion in the Westminster City Council as to whether gas washing with consequent low-flowing plumes of washed gases is acceptable. To meet the wish of the Council, both for low sulphur dioxide content and a rising plume of gases, "appears to create a problem to which no practicable solution is likely."

Oil burning still presents some problems of depositions of oily smuts. No complete and general remedy is thought to be in sight yet, despite intensive study. Experience varies from station to station.

B.o.T. Seeks Earlier Statistics on Stocks

SPEEDIER information from manufacturers on stocks of goods and work in progress is being sought by the BoT. In a letter to 800 industrialists, Sir Richard Powell, Permanent Secretary to the Board, says that with changes in stocks of the magnitude that has been reached in recent years, anything from +£170 million to −£40 million in a quarter, it is important to have this information as quickly as possible so as to assess the meaning of other statistics. Companies are also being asked to provide monthly figures, perhaps as rough estimates, where possible.

Maudling steadfast on joining Six

AS the Common Market controversy gathers steam and Ministers of the Government prepare to leave for the Commonwealth countries to discuss the issue, the President of the BoT reiterates his hope that Britain will join the Six. At the opening of a new applied research building for Alfred Herbert Ltd., at Coventry, last week, Mr Maudling said that the end of the split in Europe would give the British machine-tool industry a home market of more than 200 million people. The newly developing countries would need an "astronomical" number of tools, but machine-tool industries were being developed fast behind the Iron Curtain and there would be more competition from that direction as well as from our traditional competitors. But we need not fear this competition, he said, so long as we maintain our technical progress.

Alfred Herbert, UK's largest machine-tool makers, are certainly not lacking in this regard, for they are currently spending £350,000 a year on research and development, and the new £¼ million research department is the final stage of a £2¼ million expansion of research and development facilities begun six years ago.

Foster Wheeler's New H.Q.

Deputy Mayor of St. Marylebone, Lt - Col W. A. N. Hammond, being received by Mr J. H. Kenney, president of Foster Wheeler Corpn., and Mr C. E. H. Verity, managing director of Foster Wheeler Ltd., at the official opening of Foster Wheeler House on 16 June

U.K. Energy Consumption

TOTAL energy consumption in the UK in 1960 as compared with 1959 was 264 million ton of coal equivalent, compared with 245 million ton in 1959. For Scotland, the figures were 25 million ton and 23 million ton, respectively. Giving these totals in a written Parliamentary reply, the Minister of Power last week said that percentage increases for various fuels were as follows (Scottish figures in parentheses): Coal, 4% (6%); oil, 17% (14%); gas, 4% (2%); and electricity, 13% (11%).

BELGIAN SUPPLY JUBILEE

CELEBRATING their fiftieth anniversary this year is UEEB, the organisation representing private suppliers and distributors of electricity in Belgium. To mark the occasion, a special 205-page edition of "Votre Electricité" has been published with more than 20 articles by experts who deal with current aspects of the supply industry. The articles range from a consideration of fuel and boiler construction to design of sets and transmission systems. Control procedure and the future for carrier current communication is discussed in subsequent articles. Other papers deal with urban and rural electrification, the economic and technical aspects of nuclear generation and research in the electrical industry. The jubilee edition of "Votre Electricité" is published at 517 66 UEEB Bruxelles, Belgium. Price 75 f.

ELECTRICITY IN SHIPS

REVISED rules for electrical installations in ships, issued by Lloyd's Register, are described in the latest number of the Register's bulletin, *100A1*. One of the more important changes is the recognition of continuous maximum rating for rotating machines, so that built-in overload capacity is not required. Self-regulating alternators are given recognition as well.

Another change of significance is the remodelling of the rules for cables, which has the effect of permitting a wider choice, subject to the requirement that in general, all cables have to be of flame-retarding type. The new rules provide recognition for the fact that not all parts of oil tankers are in a special category of explosion risk.

The Lloyd's article reviewing the changes includes a reminder of the long history of electricity afloat, dating back to its use in 1874 for firing guns in a RN ship, with the first passenger ship to be fitted with electric lighting coming in 1879. Lloyd's recommendations on electricity in ships began in 1891 and, in 1894, firm requirements were written into the classification rules.

CRIMPING TOOL PATENT ACTION TO LORDS?

THE patent legal battle between Hellerman Ltd. and AMP Incorporated concerning crimping tools for electrical connectors, is still far from ended it seems. In the early action, last year, when Hellerman Ltd. sought leave to amend their patent specification, the trial judge held that the proposed amendments were limitations allowable as being by way of disclaimers. But, on appeal by AMP Inc., the Court of Appeal has now reversed that judgment and held that the proposed amendments were not disclaimers within the meaning of the Patents Act, 1949. And Hellerman Ltd. have been granted leave to take the matter to the House of Lords.

Under the original patent specification, the description of the crimping tool was wide enough to cover a device which could bond together electrical connectors of various sizes and types to conductors of different gauges and characteristics with, as the main claim, a pawl and ratchet device to prevent opening until the crimp was fully formed. As proposed to be amended by Hellerman, the emphasis of the patent would be transferred to the closing of the forming dies to a precisely determined relation, thereby limiting the possible variation of size of connector and conductor with, as an additional claim, the pawl and ratchet device. In the proposed amendment, Hellerman referred to a "stop" which they claimed would give this precise setting capacity.

In giving judgment, the Court of Appeal held that references to the "stop" could not fairly be called "disclaimers" within the meaning of the subsection. Under the original specification, undercrimping by the operator was prevented by the ratchet and pawl mechanism and no indication was there given to use the "stop" as the vital means for fixing the predetermined point of closure of the dies. The effect of the amendments is that the "stop" is the only agent for predetermining that point, and the Court held that this was "matter in substance not previously disclosed."

Widow Loses Claim

COLVILLE'S had taken reasonable precautions, Lord Wheatley ruled in Glasgow Court of Session this month when he disallowed a £5,000 claim by the widow of a man killed in 1957 while trying to clean a "live" transformer. Employed as an electric motor attendant at the steel firm's Motherwell plant, the man had been fully instructed and knew that he should only clean the transformer when it was turned off. To get into the locked compartment he had had to get the key from upstairs, and it could only be assumed that he had suffered from a mental aberration, said the judge.

Closed Circuit TV in Coutts Bank

IT'S not colour TV, but customers at the Cadogan Pl branch of Coutts Bank will be able to see whether they are in the red. A newly installed closed-circuit television system enables customers and staff in the main banking chamber to inspect ledger sheets immediately, without waiting for them to be sent down from the accounts department on a floor above. For added convenience, TV receivers in the manager's office, the waiting-room and the general office are mounted on turntables, and it is possible to speak by telephone from receiver to receiver as well as to the person operating the document scanner in the ledger room. The installation is the second to be supplied by EMI to a bank—a similar system has been in operation at Coutts' new branch in Lombard St for three months. EMI also supplied the system to a Wall St stockbroker recently.

RAILWAYS TO BUILD NEW RESEARCH CENTRE

BRITISH Railways are the latest to announce a major expansion of their research facilities. They are to build a new £1½ million block at Derby, which will be the research headquarters for the whole country. Building is expected to begin in August and will take about two years to complete.

Most of the work at the centre will be concerned with the mechanical and civil engineering aspects of railways. There will also be room for expansion of their investigations of computers, mainly of the analogue type. When the building is complete, the Director of Research will transfer from London.

EDUCATIONAL OUTLOOK

THERE should be a relationship between secondary modern schools and technical colleges comparable with that between the grammar schools and the universities, the Minister of Education, Sir David Eccles, told the annual conference of the Association of Local Education Authorities last week. A fact-finding study was planned by the Ministry to determine how far local authorities were providing schools and colleges, parents and pupils with a complete picture of the opportunities offered and the various routes that could be taken to further education.

Dip.Tech., said the Minister, had proved a success and there were now 5,000 students preparing for the qualification. The main need was for more one-year post-graduate courses "particularly in the much neglected area of engineering design."

Announced at the conference were changes in financing arrangements permitting bigger spending (up to £2,000) on minor projects, such as extensions to schools, without detailed investment control. The £20,000 limit to the cost of "minor projects" is to be removed.

After commenting on progress in recruitment of teachers, Sir David Eccles said it was necessary to study seriously new mechanical aids becoming available for teaching. Educational authorities had to be "open-minded" about these inventions, although he could understand that they might not be immediately acceptable.

N.F.E.A. BOOKLET

FULL details of wage rates in the electrical contracting industry, together with information about rates for adult males and apprentices, are given in the 1961 edition of its industrial agreements just published by the National Federated Electrical Association. Within its 78 pages, all the current agreements covering pay, hours of work, apprenticeships, etc., are reproduced in full. The price is 4s, post free.

At the Highland Show

General view of "Electricity Farm Service" exhibit at the Royal Highland Agricultural Show, Edinburgh, last week

SUSSEX WEALD LINE

ALTHOUGH expressing regret with regard to the proposals for a transmission line through the Sussex Weald, Cuckfield Rural Parish Council have decided not to support the protest of the Cuckfield UDC. One member expressed the view that if the lines were to be erected overhead it would be best to place them close to the Downs, because they would be lost to a great extent against the background of the Downs. This view had not been shared, however, by people living close to the Downs.

Several members also expressed regret at the proposal, but realised it was a thing which had to come; people became used to pylons and found they toned in with the landscape.

Progress in Consumer Protection Bill

A FURTHER step in the progress to the statute book of the Consumer Protection Bill was taken on Monday, when it passed its committee stage in the House of Lords without amendment. There was some discussion as to whether auctioneers selling houses and second hand dealers should be made liable for selling unsafe heating appliances, with electric fires in particular mentioned; but no action was taken.

Handling 300 ft Rails

EASIER handling of the 300 ft long welded rails used in some parts of London's underground system, and recovery of the rails in a condition suitable for relaying, is made possible by a specially constructed train taken into service by London Transport recently. Feature of the five-wagon train is incorporation of an electrically-powered winch arranged to take its supply from the battery of the battery locomotive pulling the train.

Power for the 8 h.p. winch, built by Clarke, Chapman, is taken from an auxiliary circuit of the battery locomotive at 310 V nominal. The winch can lift a load of 3 tons at 27½ ft/min. A safety precaution taken with the winch control is provision of spring-loaded starter buttons, which have to be pushed continuously to keep the winch moving. A further precaution is the use of lock-out remote stop buttons.

Sayings OF THE WEEK

"Today we feel that the old know less, and what they do know is irrelevant." . . . MR G. GORER, at Institute of Directors' debate on the problem of retirement.

"Economics is a subject which tends sometimes to lose contact with reality." . . . PROF C. F. CARTER, Professor of Political Economy.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, June 27

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	234½	+2½
" (3 months)	237⅝	+2½
LEAD, refined pig, 99·97% purity (cash)	65⅞	+1⅛
" (3 months)	67	+1⅛
TIN, refined, min. 99·75% purity (settlement)	928	+48
(3 months)	930½	+35½
ALUMINIUM, ingots 99·99·5% ...	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	204	—
SILVER (Troy oz)	79½d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	78⅞	+1½
" (3 months)	79½	+1⅛
RUBBER, per lb.		
No. 1, RSS, spot	24⅛d	−⅛d
c.i.f. basis, ports, Sept. ...	24⅜d	−⅛d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	67½	—
Mild Steel Tape (0·04 in.) ...	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	67	—
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	31c	—
Lead, (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

BID TERMS CRITICISED

EYEBROWS were raised in the City this week when it was disclosed that the chairman of W. H. Dorman and Co., Mr Darby Haddon, controls 50.2% of the firm's Ordinary shares. Last month the W. H. Dorman directors recommended a takeover bid from English Electric, which at the time was worth 13s 5d for the Ordinary shares, against 9s 7½d for the non-voting "A" Ordinaries.

Mr Haddon explains that the difference was approximately equivalent, on the day the terms were agreed, to the average difference between the market prices of the two classes of shares over the past two years.

In any event, the takeover should prove useful to EE. The Dorman works are alongside their own Stafford plant, and Mr Haddon says his own company's range of diesel engines, extending from 20 h.p. to 700 h.p., is complementary to EE's. Delivering their formal offer, EE say they expect to pay an unchanged 3% interim for 1961 and to maintain the 7% final on capital increased by this acquisition.

Appeal against Line Fails

A LANDOWNER'S attempt to obtain an injunction against the Ministry of Fuel and Power restraining them from granting consent to the CEGB to take power lines over his land failed in Lancaster County Court this month. In a previous case the CEGB had been awarded £400 damages against the landowner, Mr T. G. Thompson, of Halton Mill, Halton, concerning the erection of the lines, and Mr Thompson was now also claiming this amount from the MoP on the grounds that their consent was invalid.

The judge ruled that the consent was valid and said he had come to the conclusion that the action was misconceived even if Mr Thompson was right that the consent was invalid.

NO PRICE CUTTING BY SERVICE CENTRE

WHAT would the Boards do if resale price maintenance were abandoned? An unequivocal view on the question came from Mr S. F. C. Whitmore, deputy chairman of South Western EB, this week. If price cutting, already quite widespread in the appliance field, became the general thing, the Board could not be a party to it. "We could not run our business that way and, as a public corporation, it would not be proper to do so," he said.

News in Brief

Yorkshire Electricity Board are planning a new grid supply point at Low Barugh, on ground around St. Andrew's Mission Church.

The Institute of Physics and the Physical Society's autumn conference of its X-ray analysis group on "Imperfections in Crystals" will be held on 17 Nov. and 18 Nov., 1961, at the Institution of Mechanical Engineers in London.

An urgent order for a 90 kVA oil-cooled 440 V three-phase transformer for a tower crane was completed and delivered to Brighton within seven days by Wilflo Products, of Glasgow, recently.

The thirty-second Exide Convention, recently held by Chloride Batteries at Scarborough, was attended by over 300 agents and their wives.

HMTS *Alert* sailed from Greenwich on 25 June for the St. Lawrence River to complete the laying of a 400-mile length of submarine telephone cable in fulfilment of a $2½ million contract awarded in 1958 to Submarine Cables Ltd.

Forty-seven local authorities in the Southern Electricity Board's area have indicated support for Christchurch Council's protest against the increased charges for electricity supplied to domestic consumers.

Bradford and Leeds last week celebrated the fiftieth anniversary of the inauguration of a trolley-bus service in their towns. Leeds has since abandoned trolley buses but Bradford's fleet has grown from two vehicles to 193.

Southampton shopkeepers are now considering the question of Christmas illuminations in the town centre.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Low Profits

Strong competition, particularly from imports, has reduced profits of Canada's electrical manufacturers to the lowest level, Mr B. Napier Simpson, general manager of the Canadian Electrical Manufacturers' Association, has stated. An annual survey among member companies showed profits for 1960 averaged 2·3 cents on the sales dollar, compared with 3 cents for the previous year. The survey also showed that one company in every five lost money during 1960. Electrical manufacturers are caught in a squeeze between intense competition on the domestic scene on one hand, and, on the other, an increase in the amount of electrical imports into Canada, he said. In 1949, imported products amounted to 19% of the total domestic sales, but rose to 31% by 1958, and were still increasing. He also emphasised that profits in electrical manufacturing were far below those shown in surveys for all manufacturing in Canada, which averaged 5·1 cents on the sales dollar over the past nine years.

Revitalising ECA

The Electrical Contractors' Association of Ontario, which was recently fined $7,500 for "unlawful activities in the matter of electrical supplies" under the Combines Investigation Act, is being reorganised. The former secretary-manager has resigned and a successor is being sought. Meanwhile, members of the Association are being asked to subscribe $25 each to pay the fine, in accordance with a unanimously approved recommendation. The Association has also moved to 42-48 Charles St East, Toronto, and it is planned to revitalise its operations.

Another Fraser Plan

Development of the Fraser River has so far been thwarted by claims that the salmon fisheries would be seriously harmed. But now two professors at the University of British Columbia have put forward a plan for a 100 ft dam on the river near Spuzzum, 120 miles from Vancouver, which they maintain would give the minimum of interference to the migration of young and adult fish. This dam would permit a 700,000 h.p. hydroelectric development, they claim.

BERMUDA

Expansion Plan

The installation of a 6,000 kW diesel engine generating set and the laying of 18 miles of mains cable is part of the latest expansion plan of the Bermuda Electric Light Co. The generator, with engine by Nordberg, and Westinghouse alternator, is expected to be in commission about the end of this year, raising total output to over 30,000 kW. The work of underground cable laying has been in progress since February, the cable being supplied from England.

U.S.A.

River Control

A collapsible rubber dam is being used to control the flow of water to the East Pittsburgh steam power plant of the Westinghouse Electric Corpn. In effect, a giant nylon bag coated with neoprene and inflated with 40,000 gallons of water, it replaces a conventional concrete dam on Turtle Creek, a tributary of the Monongahela River, and controls the water level at intakes to condensers. Originally developed to reduce flood hazards, it has been adopted by the company because two floods in the past 25 years caused enormous damage to the plant. In the event of a rapid rise in the river level the rubber dam can be collapsed in a maximum of two hours, permitting a sharp increase in the normal 35,000 to 40,000 gal/min rate of flow. But an automatic device permits much quicker collapse of the dam if the head waters build up rapidly. When a storm causes the creek level to rise, the excess water flows over the top of the dam. The weight of this water increases the pressure on that inside the dam which is discharged when the pressure reaches a predetermined stage. With the dam deflated, water flow is increased. When completely deflated it lies flat on the bottom of the creek channel and all debris flows over it. Normally it can be inflated in about five hours from a pipe connection through a channel wall. The 6,300 lb dam, tear-drop in shape, is stretched across the creek bottom and anchored to the bottom at the upstream edge with stainless steel bolts set into a concrete slab on the floor of the creek.

IRAQ

Grid Network

As part of a plan for a national grid network for Iraq, Swiss concerns have been asked to prepare specifications for an international tender for the erection of 218 miles of power line and the associated substations. The aim is to have a widespread grid system in operation by 1965. Since 1958, three new power stations have been built in various parts of the country, and it is estimated that another 80 MW plant will be needed within the next two or three years.

W. GERMANY

Nuclear Start-up

Originally scheduled for operation last December, the West German experimental nuclear power station at Kahl, on the River Main, recently began feeding into the local grid system. The station is to have a net electrical output of 15 MW, but at the moment is operating at much below that figure. Built to the design of AEG and the General Electric Co., of New York, it is 80% owned by Rheinisch-Westfaelisches Elektrizitaetswerk, A-G, and 20% by Bayernwerk, A-G. Using slightly enriched uranium, the reactor is of the boiling water type.

TURKEY

Loan Offer

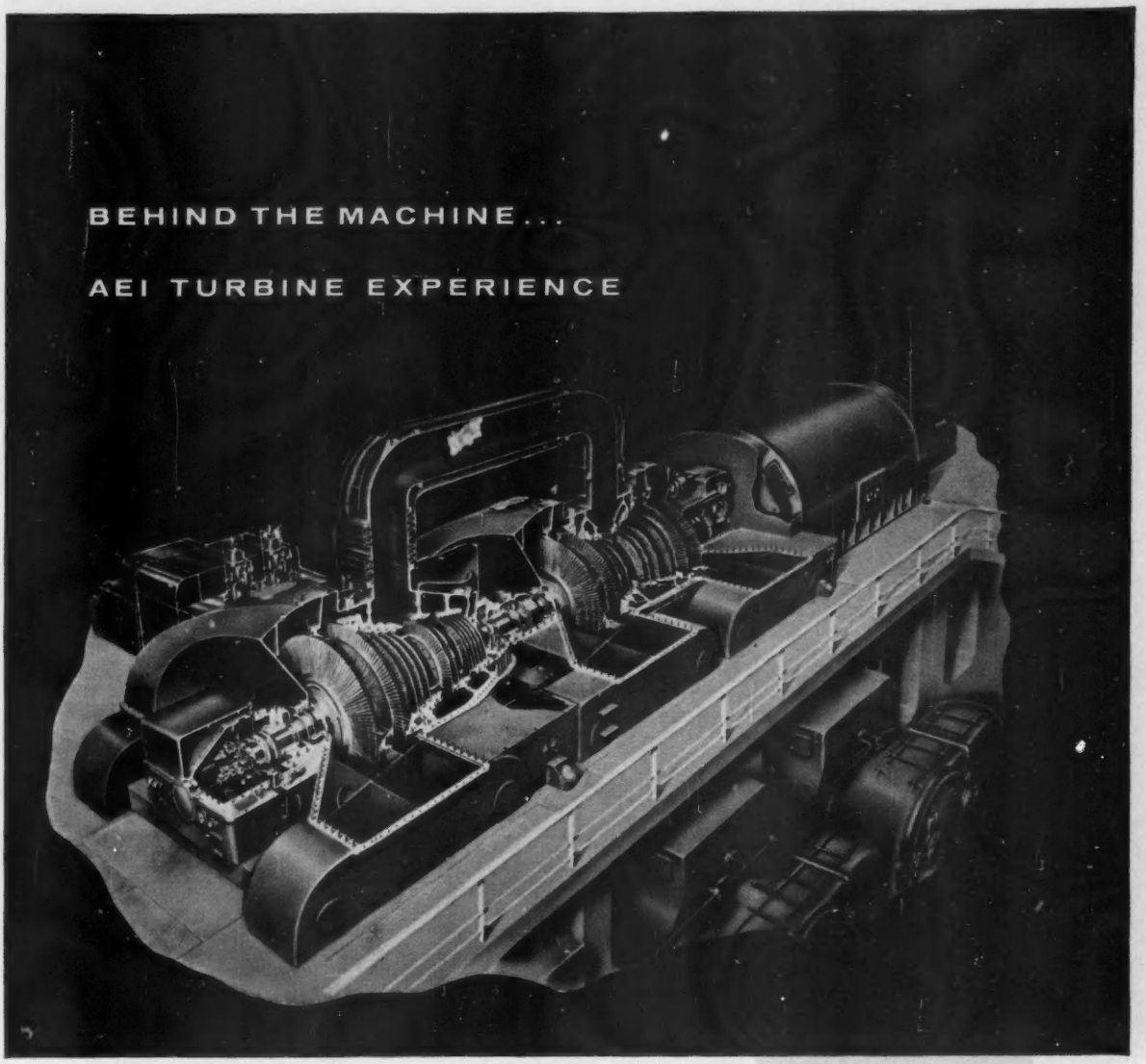
The World Bank has informed the Turkish Ministry of Finance that it is prepared to consider granting a $20 million loan for extensions to the Seyhan dam and power station, near Adana. The existing hydro-electric project was completed in 1956 at a cost of $65 million. The new offer is being studied.

INDIA

New Bombay Station?

A new steam power station, with an initial capacity of 150 MW, is to be set up in the Bombay region under the third Five-Year Plan. A report on the proposal has been studied by the Central Water and Power Commission and is being submitted to the Government departments involved. Data on three

A 10-panel 33 kV outdoor metal-clad packaged switchboard for the China Light and Power Co., Hong Kong, under construction at works of S. Wales Switchgear Ltd.



NUCLEAR POWER PLANT TURBINES

The ideal design of a turbine for use in nuclear power differs considerably from that in a conventional station. In the latter the trend is towards larger and larger individual units operating at steam conditions, rising, in the case of one unit being built by AEI, to 3500 psig (supercritical pressure) and 1100°F.

In a nuclear plant, despite progressive attainment of increased coolant temperatures, the nature of the reactor places a restriction on steam temperature and turbines must be designed to handle greater quantities of steam at lower conditions.

Such turbines must be larger than similarly rated conventional machines and the provision of an adequate exhaust area is a problem. It is overcome in AEI machines by the use of their well-known multi-exhaust system.

An AEI turbine-generator built for Berkeley Nuclear Power Station. This unit is an 83 MW, 3000 r.p.m. 2-cylinder mixed pressure turbine. H.P. steam at 310 p.s.i.a. and 604 deg. F. is expanded through six stages and is then mixed with L.P. steam at 64 p.s.i.a. and 596 deg. F.

For further information, contact your nearest AEI office or write direct to AEI Turbine-Generator Division.

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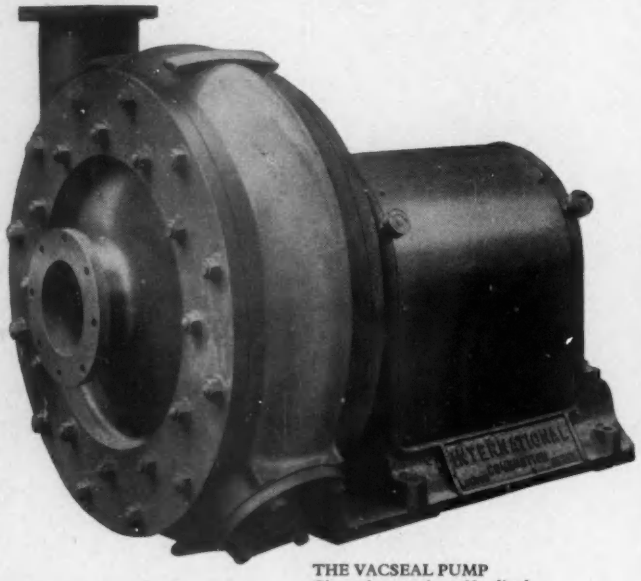

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TGA GSF 12

possible sites has already been collected with a view to selecting the most suitable location. Sites surveyed were near Kalyan, Nasik and Puntamba in Ahmednagar district, and it seems that the first named was found most favourable. The possibility of establishing another thermal plant, of a smaller size, is also being explored by the Maharashtra State Electricity Board. This plant may be located in Ahmednagar district, too.

Plant Agreement

Agreements were signed in New Delhi earlier this month between Heavy Electricals (India) Ltd. and Technoexport of Czechoslovakia for the preparation of a detailed project report for two plants. The plants are for the manufacture of heavy power equipment and high-pressure boilers. The two plants together are estimated to cost about £27 million, but the value of products to be turned out in the first stage is expected to be £15 million annually. In the first phase of development the heavy power equipment plant will manufacture 12,000 kW and 25,000 kW steam sets. The high-pressure boiler plant will produce 12 large boilers together with ancillary equipment annually.

PAKISTAN

Mangla Project

Tenders for the electrical and mechanical equipment for Pakistan's Mangla dam hydro-electric project are expected to be called this summer. Consulting engineers for the scheme are Binnie, Deacon and Gourley, of London. Tenders were recently invited for the construction of the main dam and power house. Initial capacity of the station will be 300 MW. Located on the River Jhelum, the dam will comprise an earth embankment about 370 ft high, with provision for raising it by another 50 ft.

Funds Promised

On his recent return from a tour of the USA and Europe, the chairman of the West Pakistan Water and Power Development Authority, Mr G. Ishaque, said that he had obtained promises of foreign loans totalling about $56 million for some of the Authority projects. He said that the Authority had already been offered loans of 15 million marks by Germany and $7 million by Yugoslavia for the first year's work on the master plan, beginning from 1 July. During his stay in Rome, Mr Ishaque said that he was able to obtain offers of funds for some other WAPDA projects. An Italian electrical engineering firm had offered a $45 million supply credit to Pakistan for its rural electrification plan. The offer was generally on favourable terms with an interest of 6%. He also disclosed that the Yugoslav Government had also offered a $4 million loan for the Gomal dam multi-purpose project, but the Authority wants to be assured of assistance for the entire project.

AUSTRALIA

Roma Gas Trouble

Roma power plant, in South Western Queensland, which has been operating on natural gas for a few weeks has run into trouble. It seems that the gas pressure was too great at times and it has been necessary to shut down the machine to allow the installation of a reduction valve.

HONG KONG

Underground Cables

In conjunction with technicians from British Insulated Callender's Cables Ltd., engineers of the China Light and Power Co. have commenced the installation of the first 66 kV underground power cables to be laid in Hong Kong. Estimated to cost $7 million, the work is expected to be completed about the end of this year. The new cables are corrugated aluminium sheathed, are oil-filled, and protected by a heavy p.v.c. covering. The cables and jointing equipment have been supplied by BICC through Inniss and Riddle (China) Ltd.

JAPAN

Plant Import

The import of four thermal power generating sets ranging in capacity from 350 MW to 275 MW from the USA has been authorised by the Japanese Ministry of Trade. Announcing this, the Ministry has stated that the Government are encouraging local manufacturers to produce large machines with foreign technical assistance. Hitachi, and the Tokyo-Shibaura Electric Co., are both expected to conclude such agreements with the GE, of America, very shortly.

Salisbury looks to the African

LIKE the Uganda Electricity Board (ELECTRICAL TIMES, 1 June, 1961, page 893) the city electrical engineer of Salisbury, Southern Rhodesia, Mr J. E. Mitchell, is also convinced that the greatest single field for sales development lies in the electrical advancement of the African. The remarkable post-war increases in unit sales at Salisbury have now settled down to the more normal rate of 12% in the municipal area for the year ended 30 June, 1960. Mr Mitchell points out that the growth of load has been largely confined to consumers other than domestic, where the rate of growth has fallen to only 3·2% per annum, compared with the 9·9% increase in the previous year. Even so, average domestic consumption amounted to 8,681 units for the year, compared with 8,589 in the previous year.

The monthly average of new consumers being connected continues to show a downward trend due to the slowing down of flat development in the city, but outside the municipal area, and within the city's licensed area of supply, housing development is being maintained at a steady pace. In fact, domestic consumption in the licensed area is now greater than in the city area.

In the Harari African township, electricity consumption continued to rise mainly due to the commissioning of electrically equipped hostels and kitchens, and the monthly consumption in the township is now about 1½ million units. The city's electricity department has been installing load-limiters in the township, with the result that the average consumption/house, for the first time since electricity was installed, showed a slight downward trend. Load-limiters installed in Mabvuku township have reduced consumption to about 12% of the peak amount in 1958!

Ripple control equipment, which was originally designed more than ten years ago for a system load of 80 MW, is now well overloaded, and it will be necessary to determine soon the policy to be followed to meet load conditions for the next ten years, if the operation and expansion of the remote control system for load shedding is to operate efficiently.

Altogether, the department sold nearly 426 million units during the year ended 30 June, 1960, plus 32·3 million in bulk to the Southern Rhodesian Electricity Supply Commission. The large proportion of this was supplied by the city's own power station and, after interconnection with the Kariba system on 11 May, 1960, nearly 20 million units were purchased from the Federal Power Board.

In spite of the decrease in new consumers connected over the past two years and the slowing down of electricity sales, the total potential domestic consumer units as indicated by the number of building lots surveyed and proposed has increased from 23,367 to 24,437. The latter figure includes proposed native development at Crowborough, amounting to some 3,300 stands. This is a further indication that the African is rapidly approaching the position in which he must be considered as a consumer in his own right, regardless of the method of payment of accounts. In the year covered by the report, the Distribution Department spent nearly £1¼ million on various works, including erecting and laying over 177 miles of new mains, and commissioning 109 new substations. An enormous increase in copper thefts is worrying the department, for the monetary value involved is beginning to assume serious proportions. Apparently the African is the criminal.

Approximately four times as much installation work was carried to conclusion in 1960 than in 1957; the value of thermal storage heaters dealt with last year alone was nearly six times that of 1957.

Company Activities

BRITAIN has been warned! And by no less a personage than Mr Selwyn Lloyd, Chancellor of the Exchequer. Not only is he worried about the failure of the country's exports to expand fast enough, but it can be nothing less than alarming for him to see that our "invisible" overseas earnings, which at one time comfortably covered the "gap" on visible trade, yielded no more than a microscopic £2 million for the first quarter of 1961. It is true that the £56 million Balance of Payments deficit for the first quarter showed an improvement on the £117 million deficit for the previous quarter, but it is still worryingly worse than the £37 million deficit for the first quarter of 1960. While, too, we continue to build up these deficits rather than surpluses, we must also expect loss of overseas confidence in the £ and recurrent rumours of devaluation. However much these may be denied, as they were last week, it is open for all to calculate that over 1960 and the first quarter of 1961 the UK Balance of Payments on current account shows a deficit of £400 million. It was precisely to remedy this sort of position that the Canadians last week decided to devalue their dollar. It is clear, too, that the Chancellor is worried by a resurgence of inflation at home, a factor which can easily further imperil the balance of our overseas trade.

This was the background stock markets had to contend with last week and it is not altogether surprising that the *Financial Times* industrial index dropped from 337·2 to 322·2 in just two days before recovering to 327·2.

For the most part electrical issues showed a good deal of resistance and suffered by no means as badly as some other sections of the market. It was also a week with a number of interesting results from electrical companies, including Ferranti, whose net profit dropped from £2,123,390 to £1,661,023. Not only has the company had to contend with the pressures on profit margins, now being generally reported from industry, but last year also involved heavy expenditure on research in computers and electronics.

Although Ward and Goldstone, the Manchester-based makers of cables and accessories, also did no more than maintain their dividend at 17½% last week, the fact that they *did* increase their net profit after tax from £495,457 to £513,056 may be accounted success, although the market responded by knocking a 1s off the company's 5s Ordinary shares to leave them at 31s against 32s before the results and 31s 6d at the beginning of the week.

A more positive attitude was taken to the excellent results from Radio and Television Trust, whose two main subsidiaries are Airmec and British Communications Corporation. The group profit before tax jumped from £118,060 for the previous nine-months' period to £265,782 for the year ended 31 March, 1961, while the dividend is lifted from the equivalent of 13¼% p.a. to 20% p.a. Shareholders will also collect a one-for-one free scrip issue which follows the one-for-two only last September. Up, therefore, went the company's 6d shares from 11s 7½d to 13s 6d.—*From our City Correspondent.*

Belliss and Morcom

Shortages of skilled labour hit these turbine and engine makers in the year to March. Dividend is omitted and there is a loss of £377,841. In the previous year, trading resulted in a £144,990 loss, but there was a 3% interim payment.

Copeland and Jenkins

The new factory at Chadwell Heath is not yet operating profitably, the chairman reveals, but he hopes that losses will be eliminated this year.

Dewhurst and Partner

Interim dividend is raised from 5% to 6½%. The proposed scrip issue of one "A" non-voting Ordinary share for each Ordinary share held will be made to shareholders registered on 18 July, subject to an extraordinary meeting on that day.

W. H. Dorman

Net profit is down from £94,985 to £51,715, but dividend is held at 16⅓%. Ordinary payment absorbs £29,828 and Preference £8,422.

Electric Construction Co.

Profit before tax has dropped sharply from £192,570 to £66,867 and dividend is cut from 9% to 5%. The setback is attributed by directors to excessive competition combined with rising costs. Efforts are being made to increase production to offset these factors.

Electronic Rentals

Although net profit edged back from £117,753 to £109,578, directors are meeting their forecast of a 10% final dividend on capital increased by a one-for-six rights issue. The year's payment of 20% (previously 16%) absorbs £39,322 net.

Ferranti Ltd.

The group failed to match the 1959-60 record profit, largely because of the depressed state of the North American markets. Net profit fell from £2,123,390 to £1,661,023, but dividend on the privately held Ordinary capital is maintained at 6%. Heavy expenditure on research and development of computers and in electronics was another factor in the lower earnings, directors say, and margins have decreased on some types of equipment for the supply industry. Nevertheless, input, output and unexecuted orders are all higher than previously. Demand for computers, particularly Orion, is mainly responsible for the higher input.

IST Insulations

A high level of activity in the heavy electrical machinery industry has made the year a happy one for this company. At times, demand exceeded productive capacity, particularly in the last six months, Mr J. N. Bullivant, chairman, says in his annual report. Sales have been maintained so far in the current year and, to meet this situation, additional factory space adjoining the Preston works has just been acquired.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price*	
			Earned	Paid	High	Low
1957	61,815	25,042	50·6	16⅔	1/9	1/5
1958	54,387	20,824	42·0	16⅔	1/9	1/5
1959	67,998	28,870	54·9	20⅓	3/1	1/5
1960	80,242	32,961	60·4	25	3/7	2/5
1961	121,735	42,757	90·1	29⅓	4/9	3/–

* Calendar year, except 1961 which is up to 18 May

Richardsons, Westgarth

Hopes of a final dividend have been disappointed, though there is a 1½d capital distribution to soften the blow. A sharp drop in earnings indicates that the company has been worse hit than its competitors by surplus capacity in the power plant industry. Group profit before tax fell from £516,900 to £128,042, representing an earning rate of 1·8% against 6·4% in the previous year. Apart from the tax-free payment from reserves, now proposed, there is no distribution for the year to 1 April, 1961, whereas 8⅓% was paid in 1959-60. There is cold comfort for shareholders in the directors' remarks: "It is still necessary to take contracts at uneconomical prices," they say.

Valor

Within a week of entering the electrical heating market, this company announces its intention to create 1·6 million 5s Ordinary shares. There is no immediate intention of issuing any of the shares, directors state.

Ward and Goldstone

The group's growth over the past decade, coupled with a one-for-one scrip issue last year, led some people in the stock market to be disappointed that dividend for the year to March is only equivalent to last year's 35%. But the 17½% is covered 3·4 times and, considering that a substantial amount of its business is in cables, the company did well to lift net profit from £495,457 to £513,056.

Dividends Declared

Radio and Television Trust. Yearly payment is doubled from an equivalent 10% to 20%.

Unidare. Yearly payment 12½% (*steady*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

30 June—Camberwell M.B.C. Substitution of 152 units sodium for mercury lighting comprising Group "A" Philips 200 W sodium Eleco lantern and Stewarts and Lloyds steel columns. Also 74 units 140 W and 80 W sodium transition lighting. Engineer, Town Hall.

30 June—Cardiff C.C. Electrical installations in maisonnettes, Loudoun Sq. City Surveyor, City Hall. N.I.C. firms only.—See 22 June issue.

30 June—Manchester C.C. Modernisation of Princess Rd bus depot, alterations and additions to electrical system. Firms submit names to General Manager, Manchester Corpn. Transport Dept., 55 Piccadilly, Manchester 1.

1 July—Eccles B.C. (i) Electrical installations in 192 flats. Details from architect: F. Bradley, 4 Wood St, Bolton. Deposit £2 2s.

1 July—Lochgilphead B.C. Supply and installation of 30 140 W sodium discharge lanterns and steel columns. Town Clerk.

3 July—Brownhills U.D.C. (a) Supply, erection and wiring-up of 33 200 W sodium lamps on 30 ft steel columns; (b) supply, erection and wiring-up of 62 250 W mercury vapour discharge lamps on 25 ft steel columns. Fee £2 2s. Engineer, Coombe Hse.

3 July—Cardiff C.C. (1) Class "A" lighting—supply and erection of 40 steel columns with lanterns, 250 W M/V lamps, wiring and control gear. (2) Morton stage IV supply and erection of 14 Class "A" concrete columns with lanterns/250 W M/V lamps/wiring/control gear; also 48 Class "B" concrete columns/sodium lanterns/60 W lamps/wiring/control gear. (3) Erection and wiring of 142 Class "B" lighting units with steel columns. City Surveyor, 18 Fisher St.

3 July—Farnborough U.D.C. Rewiring of electrical installations in part of town hall offices and council chamber and supply and installation of main distribution panel. Engineer, Municipal Offices, Alexandra Rd.

3 July—Leatherhead U.D.C. Installation of 13 A power points in 119 pre-war council dwellings. Engineer, Red Hse.

3 July—Manchester C.C. Supply: switchboard/control panel for City Abattoir. City Architect, Town Hall.—See 22 June issue.

3 July—Manchester C.C. Electrical installations to 179 houses and maisonnettes. Director of Housing, Town Hall.—Advertised in this issue.

3 July—Newport C.B.C. Supply and installation of radio telephones. Medical Officer, Civic Centre.—See 22 June issue.

3 July—Sandbach U.D.C. Erection of 34 Class "B" concrete columns/lanterns, six bracket arms. Engineer, Crewe Rd.—See 22 June issue.

3 July—Sowerby Bridge U.D.C. Intercommunication system installations in 37 houses, Beechwood estate. Engineer, Beech Royd.—See 22 June issue.

4 July—Friern Barnet U.D.C. Removal of 88 steel columns and erection of 88 Group "B" concrete columns with installations of lanterns/gear. Engineer, Town Hall, N.11.

4 July—Leeds Regional Hospital Board. Electrical installations to out-patients' dept. and psychiatric block, St. James's Hospital. Board Architect, Park Parade, Harrogate.

5 July—Tipton B.C. Supply and installation of 79 Class "B" lighting standards. Engineer, Sedgley Rd West.—See 22 June issue.

7 July—Ashton-in-Makerfield U.D.C. Supply of 187 Group "B" mercury vapour lighting units. Surveyor, Town Hall.—See 22 June issue.

7 July—Manchester C.C. Supply of three pedestrian-operated electric aircraft catering trucks. Airport Director, Manchester Airport, Wythenshawe.

8 July—Cuckfield U.D.C. Private street works contracts: Edward Rd (5) ancillary drainage, street lighting and seeding work; Eastern Rd (6) street lighting and ancillary works; North Rd (5) street lighting and ancillary works. Surveyor, Haywards Heath.—See 22 June issue.

8 July—Kesteven C.C. (3) Sign lighting units for motorway signs. County Surveyor, Sleaford.—See 22 June issue.

10 July—Dewsbury C.B.C. Alterations to existing installations, replacement of lighting fittings, Wheelwright Grammar School. Architect, Town Hall.

10 July—Huddersfield T.C. Supply of 500 synchronous plug-in time switches, 20 A, with solar dials. A. L. Percy, Borough Engineer and Surveyor, High St Bldgs, Huddersfield.—Advertised in this issue.

10 July—Wallasey C.B.C. Electrical installation in technical school, Leasowe. Borough Architect, Town Hall.—See 22 June issue.

11 July—Berkhamsted U.D.C. Erection of street lamps, Westfield estate. Documents from Engineer, Civic Centre. Deposit £2 2s.

11 July—Dublin C.C. 200 street lanterns. Engineering and Town Planning Dept., 28-9 Castle St.

11 July—Frinton and Walton U.D.C. Supply and erection of 37 concrete columns with side-entry colour-corrected mercury lamps. Engineer, Council Hse, Frinton.

11 July—Wallasey C.B.C. Installation of 978 socket-outlets in pre-war Leasowe area houses. Borough Architect, Town Hall.—Advertised 22 June issue.

12 July—Wallasey C.B.C. Electrical installations in 42 dwellings, Union St. Architect, Town Hall.—Advertised in this issue.

14 July—Aberdare U.D.C. Supply and installation of new synchronous striking clock to replace existing movement, Hirwaun War Memorial. Engineer, Vestry Hall.

14 July—Wortley R.D.C. Supply and installation of 40 "Highway" concrete columns with "Brampton" lanterns, lamps and control gear for Group "A" colour-corrected lighting.—See 22 June issue.

15 July—Dronfield U.D.C. Supply and installation of lighting and socket-outlet points in 35 houses, Fletcher Ave estate. Eric M. Housecroft, Housing Manager, Manor Hse. Fee £2 2s.

15 July—Rochester C.C. Erection of 500 Class "B" concrete columns together with the supply and fitting of equipment. City Surveyor, 66 Maidstone Rd.—See 22 June issue.

17 July—Manchester C.C. Electrical installations in 744 houses and flats, Handforth. Director of Housing, Town Hall.—Advertised in this issue.

18 July—Worksop R.D.C. Supply and installation of two pumps for sewage at rate of 375 g.p.m. against 33 ft head; and two pumps for sludge at rate of 100 g.p.m. against 42 ft min. head. J. H. Haiste and Ptnrs., 20 Wood La, Leeds 6.

21 July—Perth C.C. Supply and installation of 47 units Group "A" sodium lighting, A9, Aberuthven, Blackford. Co Sanitary Inspector, Co Offices.

25 July—Ilford B.C. (a) Erection and connection of approx. 1,200 columns and lanterns; (b) cable laying, jointing and trenching; and (c) thrust boring, in Group "B" street lighting, stage IV. Borough Engineer and Surveyor, Town Hall, Ilford. Deposit £2 2s.—Advertised in this issue.

31 July—North Armagh Hospital Management Committee. Installation of wiring, Lurgan and Portadown Hospital. Registered contractors only. McCandless and Barton, 6 Murray St, Belfast 1.

1 Aug.—Lytham St. Annes. Supply and erection of two 3,500 g.p.m. at 19 ft head vertical centrifugal sewage pumps complete with motors, starters and gear. Engineer, Town Hall.—See 22 June issue.

4 Aug.—Belfast T.C. Supply, delivery and erection of 33 kV and lower voltage cables and accessories. J. Dunlop, Town Clerk, City Hall, Belfast 1. Deposit £2 2s.—Advertised in this issue.

4 Aug.—Edinburgh C.C. Electrical installation, new police station, Gayfield Sq. City Architect, City Chmbrs.

9 Aug.—Wortley R.D.C. Supply and installation of street lighting in five groups. (1) 93 15 ft columns with 80 W mercury lamps; (2) 31 20 ft columns with 125 W lamps; (3) 26 25 ft columns with 3 x 80 fluorescent tubes; (4) 68 25 ft columns with 250 W mercury lamps; (5) 77 20 ft and 15 ft columns with 125 W and 80 W mercury lamps. Arthur Wikeley, Council Offices, Grenoside, Sheffield.

14 Aug.—E.B. for N. Ireland. Specification NI.1635. Supply and installation of 400 V switchgear at Coolkeeragh Power Station. Kennedy and Donkin, 64 Royal Exchange, Manchester 2.—See 22 June issue.

26 Aug.—Bradford B.C. Installation of electric wiring, three dwelling, Scar Hse Reservoir, Harrogate. Waterworks Engineer, Darley St.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 115 queries answered this week

"Marvel" switches—makers of? E.J.D.—Simplex Electric Co. Ltd., Broadwell, Oldbury, Birmingham.

"Isofuse" fusegear—makers of? C.A.—Brookhirst Igranic Ltd., Bedford Wks, Elstow Rd, Bedford.

"Hanaulux" shadowless lighting fittings—agents for? T.B.—Sierex Ltd., 241 Tottenham Court Rd, W.1.

"Coll-Ace" grinders—makers of? M.C.—A. M. Collins and Co., 88 Golden La, E.C.1.

"Ibis Kendal" tailors' iron—makers of? M.E.B.—Isaac Braithwaite and Son Engineers Ltd., Ibis Wks, Kendal, Westmorland.

"Calthorpe Mypol" floor polishers—address for spares? G.H.—Dowding and Plummer Ltd., 2 Jakeman Walk, Birmingham 12.

"Pyrobit" sealing iron—makers of? T.E.—Acru Electric Tool Mfg. Co. Ltd., Dennings Rd, Councillor La, Cheadle, Cheshire.

"Maxtrip" lighting fittings—suppliers of? E.E.B.—British Electric Lamps Ltd., Spencer Hill Rd, Wimbledon, S.W.19.

"Zanker Rotella" spin dryers—importers of? L.E.B.—Bradfax Ltd., Castle Blaney Bldgs, Barry St, Bradford 1; and N. J. Tendlow, 16 Lindisfarne Rd, Shipley, Yorks.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

3 July—Burma. 50 lb 23 s.w.g. tinned copper fuse wire; 40 lb 22 s.w.g. tinned copper fuse wire and 50 lb 18 s.w.g. tinned copper fuse wire. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/20068/61).*

3 July—Burma. 500 high-pressure mercury vapour lamps, 230 V, 125 W, with Edison screw caps. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/20067/61).*

3 July—Burma. 12 electric motors. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/20066/61).*

4 July—Greece. Nine automatic groups for coupling town power net with an auxiliary generator couple. Ministry of Trade, Fourth Floor, 50 Socratous St, Athens. B.o.T. (ESB/19586/61).*

6 July—Burma. 20,000 mid-span 8 in. transposition brackets; separation equipped with insulators; 150 tons 8 a.w.g. copper wire weld; 15,000 compression sleeves and 15,000 off-set dead-ends. Director-General, Posts and Telegraphs, 125 Phayre St, Rangoon. B.o.T. (ESB/20088/61).*

7 July—Formosa. Switchgear: 1 lot indoor type metalclad switchgear. Central Trust of China Purchasing Dept., 68 Yen Ping Nan Rd, Taipei, Taiwan. Tenders in quadruplicate on standard forms, four copies of all additional documents. B.o.T. (ESB/20416/61).*

11 July—Iran. Ice-making plant for sugar mill, capable of 1,000 kg daily. Ammonia compressor, 210/380 V electromotor and crane for lifting and expulsing blocks. Iran Sugar Corpn., Avenue Shah Reza, Tehran. B.o.T. (ESB/20096/61).*

12 July—S. Africa. One automatic steam generator. Chief Stores Superintendent, South African Railways, P.O. Box 8617, Johannesburg. B.o.T. (ESB/20040/61).*

18 July—New Zealand. 80 elapsed time meters, 230 V a.c., 50 cycles, counting up to 99,999 hours; 100 frequency meters, 47/50/53 cycles in cycle steps, 230 V a.c., single-phase. Director-General (Stores Div.), G.P.O., Wellington. B.o.T. (ESB/20044/61).*

19 July—New Zealand. Cable, polythene insulated and p.v.c. sheathed to N.Z. P.O. specification 488: 1,000 miles, type 4 wire; 50 miles, type 8 wire; and 153 miles, type 3 wire. Director-General (Stores Div.), G.P.O., Wellington. B.o.T. (ESB/20035/61).*

22 July—Iraq. Stranded copper and stranded aluminium conductors. Majlis Mosul Municipality, Mosul. B.o.T. (ESB/19168/61).*

22 Aug.—India. Rihand Project. Supply of protective gear equipment for Mirzapur-Allahabad-Kanpur 220 kV transmission lines. Director of Designs, Rihand Hydro-Electric Design Directorate, 10/499 Allenganj, Kanpur, U.P. B.o.T. (ESB/20091/61).*

23 Aug.—Uganda. Electricity Board transmission and distribution scheme: (i) Western line, 184 route miles, 132 kV and 66 kV wood pole transmission lines. (ii) Toro, 36 route miles, 33 kV w.p. distribution line; 69 route miles, 11 kV w.p. distribution line; 14 route miles L.V., T.P. distribution line. (iii) Acholi-Lango, 33 route miles, 66 kV w.p. transmission line; 113 route miles, 33 kV w.p. distribution line; 69 route miles, 11 kV w.p. distribution line; 25 route miles L.V., w.p. distribution line. (iv) Bunyoro, 128 route miles, 33 kV w.p. transmission line; 26 route miles, 11 kV w.p. distribution line; and 12 route miles L.V., w.p. distribution line. (v) Kabale, 25 route miles, 11 kV w.p. distribution line; seven route miles L.V., w.p. distribution line. Kennedy and Donkin (East Africa), P.O. Box 2825, Kampala. B.o.T. (ESB/20098/61).*

Gazette Announcements

COMPANIES ACTS

Milldale Electric Co. Ltd. Mr L. H. Shipton, 31 Lloyd St, Manchester 2, appointed liquidator on June 9 for the purpose of voluntarily winding-up.

Markwells (Electrical Supplies) Ltd. Mr E. S. Dixon, 18 Mackenzie St, Slough, appointed liquidator from 31 May for the purpose of voluntarily winding-up.

Whelan Wholesale Co. Ltd. Mr R. A. Flamank, 87 Holyhead Rd, Birmingham 2, appointed liquidator from 5 April.

Davis Electrical & Radio Accessories Ltd. General meeting to be held at 14 Harley St, London W.1, on 20 July, at 11 a.m., to receive account of the winding-up.

John Hunter and Co. (Electrical Engineers) Ltd. General meeting of members at 1-3 Stanley St, Liverpool, on 26 July at 10.30 a.m., followed by meeting of creditors, same place and day, 11.30 a.m.

Lee Domestic Appliances Ltd. First meeting of creditors and contributories, Room 401, Inveresk Hse, 346 Strand, W.C.2, 30 June. Creditors, 10.15 a.m.; contributories, 10.45 a.m.

BANKRUPTCY ACTS

Receiving Orders

Kingston upon Thames. W. E. Chappell, building and electrical contractor, formerly carrying on business at Station Approach, Shepperton, Middx. Order dated 14 June.

High Court of Justice. A. L. Crowe, company director, formerly trading as Regional Distributors (electrical goods suppliers), at Westbourne Park Mews, W.2. Order dated 7 June.

Cambridge. D. and D. Halsey, electrical dealers, formerly carrying on business at 43 High St, Buntingford. Order dated 8 June.

Cardiff. T. K. Price, domestic electric appliance retailer, formerly carrying on business at 99 Clifton St, Roath. Order dated 12 June.

Croydon. Mrs E. G. Page, formerly trading as Jim Langley, electrical contractor, of 33 Heathurst Rd, Sanderstead. Order dated 13 June.

Winding-up Orders

High Court of Justice. F. and B. Electrics Ltd. Regd. office: 521 Staines Rd, Bedfont, Middx. Order dated 12 June.

High Court of Justice. Kevin Electrical Industries Ltd. Regd. office: 33 Longdon Wood, Keston Park, Farnborough. Order dated 12 June.

Appointment of Trustees

Kingston upon Hull. F. Sutton, electrical goods dealer, formerly carrying on business at 8 Southcoates La, Kingston upon Hull. Trustee: S. D. Moore, 4 Silver St, Hull, appointed as from 12 June.

Wakefield. C. Arrand, agricultural and electrical engineer, formerly carrying on business at 44 High St, Rawcliffe, nr. Goole. Mr S. D. Moore, 4 Silver St, Hull, appointed trustee from 15 June.

First Meeting and Public Examinations

Bournemouth. K. R. Cockerton, hardware and electrical dealer, formerly carrying on business as Bournemouth Domestic Appliance Services at 206 Herbert Ave, Parkstone, Poole. Public examination: 10.30 a.m., 20 Sept., The Law Courts, Stafford Rd.

High Court of Justice. A. L. Crowe, electrical goods supplier, formerly carrying on business at Westbourne Pk Mews, W.2. First meeting, 11 a.m., 5 July, Bankruptcy Bldgs, Carey St, W.C.2. Public examination, 11 a.m., 5 Oct., Bankruptcy Bldgs.

Cardiff. T. K. Price, domestic electric appliance dealer, formerly carrying on business at Clifton St, Roath. First meeting: 2.30 p.m., 30 June. Official Receiver's Office, Westgate St. Public examination: 10.30 a.m. 4 Aug., same address.

Cambridge. D. and D. Halsey, electrical dealers, formerly carrying on business at High St, Buntingford. First meeting, 11 a.m., 29 June. Official Receiver's Office, Sidney St. Public examination, 10.30 a.m., The Guildhall.

Release of Trustees

High Court of Justice. M. T. Goldberg, TV, radio and electrical appliance dealer, formerly carrying on business at Brookfield Rd, Hackney. Trustee: A. A. Walter, Official, Bankruptcy Bldgs, Carey St, W.C.2, released from 14 June.

Dividends

Harrogate. J. C. Bruce, electrical dealer, formerly carrying on business at Cunliffe Rd, Ilkley. Dividend per £: 4s, payable 16 Brook St, Ilkley, Yorks, 5 July.

Cardiff. R. J. Bickerstaffe, electrical goods retailer, formerly carrying on business at Ormond Rd, Richmond and Richmond Rd, Kingston. Dividend per £: 8¼d, payable the Official Receiver's Office, County Court Bldgs, Cardiff.

TRADE NOTES

Changes of Address. The London offices, showrooms and service department of the Ferrograph Co. (incorporating also British Ferrograph Recorder Co. Ltd., Rendar Instruments Ltd. and Wright and Weaire Ltd.) have moved to 84 Blackfriars Rd, S.E.1. Telephone Waterloo 1981.

The National Council for Technological Awards has moved to 24 Park Crescent, London W.1. Telephone Langham 4879.

The Manchester office of the English Electric Co. Ltd. is now at English Electric Hse, Crossford Court, Dane Rd, Sale, Cheshire. Five departments occupy the new offices: the Manchester branch office, the textile division, the switchgear drawing office, domestic appliance sales and domestic appliance service. Telephone numbers are: plant and equipment, Sale 8211/7; domestic appliance sales, Sale 8296/8; and domestic appliance service, Sale 2244/5.

As from this week, H. Page and Sons, electrical contractors, have moved from the Wool Exchange and are now operating from 19 Southwark St, S.E.1. Telephone Hop 1164.

The Government and Industrial Valve Division of Mullard Ltd. is now at 80 New Oxford St, W.1. Telephone Langham 5522.

B. and H. (Nottingham) Ltd. have moved to Grove Works, Louthwaite Rd, Clifton, Nottingham. Telephone Trentside 383.

Vactric Control Equipment Ltd. have now moved from Vactric Hse, Sloane St, to 33 Bouverie St, E.C.4. Telephone: Ludgate Circus 7061.

Agents. Aveley Electric Ltd. have been appointed sole U.K. agents for the Hudson Tool and Die Co. Inc. of Newark, N.J.

CONTRACTS PLACED

Chelmsford B.C. Provision/erection/painting of steel columns with 200 W sodium lanterns, London Rd (A12), Abacus Municipal Ltd.

City of London. Installation of electric lighting, Tower Bridge, Universal Installations Ltd., £6,131.

London C.C. Storm water pumping plant at Falcon Brook Pumping Station, Battersea, Vickers-Armstrong (Engrs.) Ltd., £149,231. Recommended.

Luton B.C. Williams and Richardson to carry out installations in 70 old people's flats, Lewsey Farm estate, £6,339; H. C. Janes Ltd. to carry out installations in proposed central library, £29,202.

Larne B.C. Installations in new municipal offices, Jas. Thompson Ltd., £3,972. Recommended.

Stepney B.C. Stage 6 of street lighting improvements in Borough, G.E.C. Ltd. Recommended.

Swinton and Pendlebury B.C. Electrical installations, The Beehive estate, Clifton, Wm. Lee, Market St, Atherton, £3,114. Recommended.

BUSINESS PROSPECTS

Barnsley. Research/showroom premises, Nelson, Canning and Wortley streets, proposed for Wilson and Longbottom Ltd. Architects: Murray, Ward and Ptnrs., 32 Wigmore St, W.1.

Bath. New factory proposed at Brassmill La for Rotork Engineering Co. Ltd., Lower Mill, Twerton, Bath.

Billingham-on-Tees U.D.C. Tender: 116 houses, 18 flats, Low Grange estate. E. Shaw, Surveyor, Council Offices, Haverton Hill-on-Tees.

Birmingham. The Birmingham Post and Mail Ltd., 38 New St, Birmingham 2, propose development of Steelhouse La and Weaman St. C.C. is recommended to lease to the Ministry of Works proposed workshops for Post Office Engineering Dept. M.o.W. Architects' Dept. is at Abell Hse, John Islip St, S.W.1. C.C. is recommended to lease land for erection of a warehouse. Central Land Investments Ltd., 35 North Audley St, London W.1, propose to obtain tenders late this year for a shopping centre at Perry Barr; cost £1 million; architects: J. Brian Cooper and James A. Farquhar, 10 St. George St, W.1.

Blackpool. Education Committee propose St. Catherine's R.C. secondary school, to cost £129,250.

Bolton. Planned: four-storey hotel, with shops, flats and houses at Lynefield, Chorley New Rd, by Keldar Ltd., Bolton. Plans include eight shops and 56 dwellings.

Braintree. The North East Metropolitan Regional Hospital Board, Eastbourne Terr, W.2, have £35,450 proposal for wards conversion at Black Notley Hospital.

Bucks. County E.C. plan: erection of Bletchley grammar technical school, £182,301; extensions: Warren Field comprehensive school, £189,738; erection of Iver secondary school, £134,420; erection of Danesfield primary school, Medmenham, £59,018. County Architect, Aylesbury, Bucks.

Buxton. Extensions to works at Bridge St proposed by Brake Linings Ltd., Bridge St.

Cambridge. Proposed New Hall college for women, with accommodation for 300 students. Architects: Chamberlin, Powell and Bon.

Chester-le-Street. A. and M. Partners Ltd., builders, West Terr, Wardley, propose 51 houses and nine bungalows at Fatfield.

Darlington. R. Blackett and Son Ltd., builders and contractors, Bondgate, Darlington, propose 128 houses and two flats, Devonshire Rd.

Dewsbury. Healey and Baker, 29 St. George St, London W.1, propose industrial development, Springfield area or at Thornhill Lees.

Eastry. R.D.C. propose new factory at Spinney La, Aylesham.

Felling. A new factory and offices at Green La are planned for Elders, Walker and Co. Ltd., Sunderland Rd, Gateshead 8.

Guildford. Debenhams Ltd., 97 High St, Guildford, propose new department store, to cost about £1 million, High St.

Harrogate, Yorks. The erection of a 12-storey block of luxury flats at Park Pl proposed by Park Place, Harrogate, Ltd., Park La, London W.1. Phases one and two may cost £750,000. Architect: Morris de Metz, 29 Gloucester Pl, London W.1.

Hastings. W. M. Still and Son Ltd., kitchen equipment manufacturers, 29 Greville St, E.C.1, propose 100,000 sq ft factory, Broomgrove. Corporation E.C. propose Hastings grammar school, to cost £246,881.

Hemel Hempstead. Herts County E.C. plan a secondary school and youth wing at Highfield, £282,380; a junior school and infants' school at Gadebridge Rd, £137,385; a new Halsey secondary school at Gadebridge, £276,730. County Architect, Hertford.

Hull. Welfare Services Committee propose welfare home with 60 beds to cost £71,500. Committee has recommended acceptance of a £66,529 tender for erection of hostel for mentally disordered persons at Leads Rd. Contractors: Wright and Son (Hull) Ltd., 57 Regent St, Hull.

Lancashire. County E.C. propose college of music at Manchester for 450-500 students. Estimated cost: £242,250.

Leicester. Shop development with a public house at High St proposed by Holloways Developments Ltd. Contractors: Holloway Bros. (London), Millbank, S.W.1.

Liverpool. Littlewoods Mail Order Stores Ltd., Waterloo Bldgs, Cases St, Liverpool, propose a 14-storey headquarters, Old Hall St. Erection of bank premises with offices over at 77 London Rd is proposed by Midland Bank Ltd., London E.C.3.

London. A block of flats at 77 Shepherd's Hill, Highgate, N.6, planned by Clyde Young and Bernard Engle, architects, 8 New Sq, Lincoln's Inn, W.C.2. C. H. Elsom and Ptnrs., architects, 10 Lower Grosvenor Pl, S.W.1, propose office building at Berners St, Commercial Rd and Sander St, St. Pancras, N.W.1, N.W.: flats are planned at 72-94 Regent's Park Rd; architects: M. Lyell and Associates, 16 Yeoman's Row, S.W.3. Planned: rebuilding headquarters of Church Missionary Society on site at Trinity Church Sq, Southwark, S.E.1; R. Atkinson and Ptnrs., architects, 13 Manchester Sq, W.1. Proposed: 21-storey office building surmounted on a two-storey podium at 2-20 Upper Ground, South Bank, near Blackfriars Bridge; Michael Lyell and Ptnrs., architects, 16 Yeoman's Row, S.W.3. A 16-storey block of offices at Albert Embankment, S.W., to be erected by Sir Robert McAlpine and Sons Ltd., 80 Park La, W.1; cost: £1,500,000. Ronald Ward and Ptnrs., 29 Chesham Pl, S.W.1, propose to redevelop Odeon Cinema site in Tottenham Court Rd, W.; a block of shops, offices and 44 flats is planned; cost: £400,000. General Electric Co. Ltd. propose to demolish Magnet Hse in Kingsway, W.C.2, and redevelop the site. Proposed by Erno Goldfinger, architect, 69 Piccadilly, W.1, offices, shops and flats on the Bloomsbury Sq-Southampton Row-High Holborn-Vernon Pl site. B.B.C., Portland Pl, W.1, plan workshops, stores, film unit and offices, Wood La television centre. Proposed: shops and offices at Uxbridge Rd, W., by Sutcliffe, Taylor and Ptnrs., architects, 5 Manchester Sq, W.1. Proposed by Stone, Toms and Ptnrs., architects, 28 South Audley St, W.1, flats and offices, on site junction of Eccleston Sq, Gillingham St and Bridge Pl, Victoria, S.W.1. Showrooms, with flats, at the junction of Park La and Brick St, W.1, planned by Norman Green, architect, 12 Adeline Pl, W.C.1. The West Ham Group Hospital Management Committee propose rebuilding the war-damaged wards at St. Mary's Hospital, and erection of a casualty ward, X-ray dept., an administrative residential building; cost: £500,000.

Manchester. Metro-Provincial Properties plan a new 25-storey office block in Portland St. Design Partnership Ltd., Ibex Hse, Minories, London E.C.3, plan seven-storey residential club, with offices, at St. John St.

Merthyr Tydfil. The Corporation Planning Committee has approved a £2 million plan for development of town centre by Chesterfield Properties Ltd., 8 Chesterfield St, W.1.

Middlesbrough. Plans prepared by R. Cowan, 20 Finkle St, Stockton-on-Tees, for alterations and additions, Snowdon Rd, for Middlesbrough Hide and Skin Market Co. Ltd. Offices or machine shop development proposed on land at East St and Gray St and Lower Feversham St for Head, Wrightson and Co. Ltd., Thornaby-on-Tees. Proposed: shops and office block by the Metropolitan Railway Surplus Lands Co. Ltd., Kensal Hse, Harrow Rd, N.W.10.

Newcastle upon Tyne. 13-storey block of luxury flats, Newcastle Town Moor, to cost £250,000, planned by Greensitt Bros., builders and contractors, Nixon St, Newcastle.

N. Ireland (Armagh). City Council plan £90,000 extensions to Convent secondary school.

Oxford. City Council 1963 building programme will include: combining City of Oxford and Southfields School to form boys' grammar school, £207,000; extensions to Edmund Campion R.C. School, £54,250; extensions to Blackbird Leys Secondary School, £93,363; a new R.C. school at Blackbird Leys, £56,000; new Summertown C.E. junior school, £43,750. Regional Hospital Board, Banbury Rd, Oxford, plan nurses' home at Marlborough Children's Hospital; industrial rehabilitation unit, River Mead Hospital; Stage 3 of accommodation for mental patients at Longworth Hospital. Governors of New College propose students' accommodation, Sacher Bldg. Architect: D. Roberts, 33a Bridge St, Cambridge.

Portsmouth. Planned: extensions to factory, Fratton industrial estate, for Bell Punch Co. Ltd.; extensions at Rodney Rd for Patomic Ltd; extensions, Cornwall Rd, Fratton, for J. Palmer Ltd.

Potters Bar. Atlas Securities Ltd. plan six shops and offices at Barnet Rd. Contractors: C. L. Nye Ltd., Cranbourne Rd, Potters Bar.

Rochdale. Work beginning on three-storey 65,000 sq ft extension to Arrow Mill, a branch of Courtaulds Ltd. Cost: £400,000. Contractors: John Laing and Son Ltd., Mill Hill, N.W.7. Corporation E.C. propose five schools: Hewarth Cross secondary, Halifax Rd junior and infants, St. Peter's C.E. infants, St. Gabriels R.C. junior and infants, and a R.C. convent secondary school; also proposed is the Matthew Moss secondary school.

Rotherham. Factory on a two-acre site, Catcliffe, to be erected for G. L. Willan Ltd., steel manufacturers, Sussex St, Sheffield.

St. Albans. The N.W. Metropolitan Regional Hospital Board, Eastbourne Terr, W.2, have placed a £42,000 contract with Davis and Rentowl Ltd., 102a Victoria St, St. Albans, for erection of nurses' quarters at the City Hospital.

Sheffield. A new school to cost £300,000 planned at Dinnington for West Riding County E.C., Wakefield.

Southport. Planned: extensions to works for Tulketh Steel and Engineering Co. Ltd., Tulketh St.

Swindon. Sealey Engineering Co. Ltd., 148 South Park Rd, S.W.19, propose a new factory at industrial estate.

Thornaby-on-Tees. 16 small factories are planned in development of a small trading estate on the Thornaby airfield site, for Boden Developments Ltd., The White Bldg, Fitzalan Sq, Sheffield 1.

Tynemouth. Shops, offices, flats in three storeys, planned for C. Dunleavy, 27 Kennersdene, Tynemouth. Architects: R. Hall, 11 John St, Cullercoats, Whitley Bay.

Wantage. A modern school at Challow Rd proposed by Berkshire County E.C., Reading.

Welwyn Garden City. Herts County E.C. plan major extensions to grammar school, £189,890.

Wimbledon. A seven-storey block of offices with ground-floor shops and basement car park on site of the Odeon Cinema, proposed by Rank Property Development Ltd. Contractors: Richard Costain Ltd., Westminster Bridge Rd, S.E.1.

Winchester. Shops and offices at St. Peter St proposed by Dunraven Holdings Ltd. Morrison, Rose and Ptnrs., 4 Wimpole St, W.1, architects.

Windsor. Multi-storey flats with tennis courts and swimming pool at St. Leonard's Hill planned by James Miller and Ptnrs., 7 Suffolk St, Pall Mall, S.W.1.

Worcestershire. County E.C. has placed a contract with A. H. Guest Ltd., Coalbourne Brook, Stourbridge, Worcs, at £342,940, for erecting proposed Shenstone Training College.

Workington. Thos. Armstrong Ltd., Cockermouth, to build 240 houses.

Yeovil. Geo. Brown and Ptnrs., Equity and Law Bldg, Baldwin St, Bristol, architects for proposed 300 houses/shops on 40-acre site. B.C. propose municipal offices/library/museum, costing £218,000, and town hall, costing £172,360, Hendford Manor.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

C. J. Armstrong Manufacturing Co. Ltd. Electrical engineers, etc. Nom. cap.: £5,000. Dirs.: to be appointed by subs. Subs.: Edgar Levy, 72 New Cavendish St, W.1; and Nicholas T. Levison.

J. G. Beck Ltd., 15-16 Rathbone Pl, Oxford St, W.1. Manufacturers of and dealers in general electrical equipment, etc. Nom. cap.: £100. Dirs.: John G. Beck and Walter D. Cattermole.

G. R. Birch and Cuffin Ltd. Electricians, electrical contractors, etc. Nom. cap.: £5,000. Dirs.: to be appointed by subs. Subs.: Walter N. Radcliffe, Tamerton Foliot, nr. Plymouth; and Frederick W. Newbery.

Brewster Precision Instruments Ltd., "Doone," London Rd, Camberley, Surrey. Designers and manufacturers of and dealers in electrical instruments, etc. Nom. cap.: £5,000. Dirs.: Sydney Brewster, Edward Klein, Mrs Florence M. Brewster and Mrs Patricia M. Klein.

Bristol Electrics (Installations) Ltd., 280 Whitehall Rd, Bristol 5. Nom. cap.: £1,000. Dirs.: Ernest R. Caines and Clifford R. Caines.

Charlesworths of Crewe Ltd., 14 High Town, Crewe. Dealers in vacuum cleaners, electrical appliances, etc. Nom. cap.: £29,000. Dirs.: Joseph H. Charlesworth and Noel R. Charlesworth.

Classhades Ltd., 8 Seaford Rd, Hove. Lampshade manufacturers and dealers, etc. Nom. cap.: £2,500. Dirs.: Peter R. K. Trotter, Fredk. J. C. Turner, Joseph H. Haslam and Alfred R. Sawyer.

T. Dambitis Ltd., 31 Pemberton Drive, Bradford 7. Electrical engineers and general electrical installation contractors, etc. Nom. cap.: £1,000. Dirs.: Teodors Dambitis and Mrs T. Dambitis.

Dartronic (Sales) Ltd., 3-7 Windmill La, Stratford, E.15. Dealers in electronic instruments and accessories, etc. Nom. cap.: £100. Dirs.: Dennis A. Robinson, Anthony Jannece and Richard F. Herbert.

Deakin, Phillips Electronics Ltd. Nom. cap.: £3,000. Dirs.: Trevor H. G. Deakin, 20 St. Nicholas Drive, Shepperton; and Benjamin G. Phillips.

Domus (Housing Services) Ltd., 16 Hazelwood Rd, Northampton. To take over the business of housing consultants and electrical and plumbing contractors carried on as "Domus" at 15 Church St, Cogenhoe, Northants, etc. Nom. cap.: £100. Dirs.: Sydney G. Jeffery, Donald B. Coles and Joseph M. F. Wright.

Electrical Installations (Sussex) Ltd., Site 2, Westfield Rise, Saltdean, Brighton. Nom. cap.: £100. Dirs.: Henry J. Haines and Michael A. Chapman.

G. D. Evans and Sons Ltd., 36 Mackenzie St, Slough. To take over the business of electrical appliance dealers carried on as "G. D. Evans" at 322 High St, Slough, etc. Nom. cap.: £1,000. Permanent dirs.: Glyn D. Evans and Mrs G. M. Evans.

G.M. Electronics Ltd., 86a High St, Southall, Middx. Nom. cap.: £100. Dirs.: Alfred Gale, Edith Anthony and Wm. Morton.

Haven Domestics (Manchester) Ltd., 385 Stockport Rd, Manchester 12. Radio and electrical domestic appliance retailers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Joseph A. D. Nugent and Mrs Dilys E. Nugent.

H.N. Electrical Manufacturing Ltd., 1 Hatton Gdn, Holborn Circus, E.C.1. Manufacturers of and dealers in recording machines, dictation machines, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Michael L. Oliver and Stanley F. Bridle.

Howard Electronics Ltd., 261 Chiswick High Rd, W.4. Nom. cap.: £1,000. Dirs.: David L. Silver and Frances M. Howard.

David S. Jacobs and Sons Ltd., 31-2 Haymarket, S.W.1. Electrical engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: David S. Jacobs and Mrs H. Jacobs.

Ladywell Electrics Ltd., 73 Ladywell Rd, S.E.13. Nom. cap.: £500. Dirs.: Fredk. H. Newman, Jeffrey C. Dowland, Mary J. Newman and Joan Dowland.

M. Leigh Ltd., 69 Gloucester Pl, W.1. Electrical goods manufacturers and dealers, etc. Nom. cap.: £100. Dirs.: Max Leigh and Bella Leigh.

Marland Electrical Engineering Co. Ltd., 5a Spring La, Colne, Lancs. Nom. cap.: £100. Dirs.: Keith Rowlands and Benjamin Marsden.

Neon Construction Co. Ltd., 17 Berryfield Rd, S.E.17. Neon and general signmakers, etc. Nom. cap.: £1,000. Dirs.: Armand Debono and Derek G. Warner.

North and Ward (Electrical) Ltd., 10a Holbrook La, Coventry. Manufacturers of and dealers in radio and television apparatus, etc. Nom. cap.: £500. Dirs.: Reginald T. M. North and Barry J. Ward.

Olson Electronic Ltd., 273 Whitechapel Rd, E.1. Nom. cap.: £1,000. Dirs.: Andrew T. Olszewski and Jan M. Olszewski.

Orwell Electrics Ltd., 8a Orwell Rd, Felixstowe. To take over the business carried on at Felixstowe as "Orwell Electrics," etc. Nom. cap.: £3,000. Permanent dirs.: John G. Parke and Norman J. Brundle.

Vault Guard Co. Ltd., Cheapside Hse, 135-147 Cheapside, E.C.2. Electricians, electrical, mechanical and constructional engineers, etc. Nom. cap.: £100. Dirs.: Peter A. C. Smith and David G. Chaffey.

Wadar Ltd., 14 Ironmonger La, E.C.2. Electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Gerald L. Wells and David J. Davis.

F. N. Wilson (Electrical Contractors) Ltd., 24 Aldermans Hill, Palmers Green, N.13. Nom. cap.: £2,000. Dirs.: Fdk. N. Wilson, Wm. H. Mourge and Kathleen M. Wilson.

MEETINGS TO NOTE

TUESDAY, 4 JULY

ROYAL SHOW, Cambridge, until 7 July.

WEDNESDAY, 5 JULY

A.S.E.E. (North London). Talks by members on technical subjects in their own fields. Civic Centre, Wood Green, N.22. 8 p.m.

A.S.E.E. (S. East London). Chairman's address. Eltham Green School, Queenscroft Rd, S.E.9. 7.45 p.m.

A.S.E.E. (Manchester). "Electrical Aids to Security and Against Burglary and Sabotage," G. E. Martin, M.A.S.E.E. Engineers' Club, Albert Sq. 7.15 p.m.

A.S.E.E. (Preston). "Heavy Industry Control Gear," C. Curran, GRAD. I.E.E. R.A.F.A. Club, East View. 7.30 p.m.

FRIDAY, 7 JULY

RUSSIAN TRADE FAIR. Earls Court, until 29 July.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Bush in design. 813,674. Class 9. Instruments and apparatus for use in wireless telephony, television and telecommunication, etc. Bush Radio Ltd., 11 Belgrave Rd, Victoria, S.W.1.

Danbridge Denmark in design. B809,526. Class 9. Measuring bridges and apparatus, etc. A/S Danbridge, 47 Brigadevej, Copenhagen, Denmark.

Elecco. 808,318. Class 9. Apparatus and instruments; insulated cables and wire, etc. 808,319. Class 11. All goods included. 808,320. Class 19. All goods included. Engineering and Lighting Equipment Co. Ltd., Sphere Wks, Campfield Rd, St. Albans, Herts.

Lectropak. B805,666. Class 11. Installations for heating, lighting, etc. Mackenzie and Moncur Ltd., Balcarres St, Edinburgh.

Mip Thermeter. 811,737. Class 9. Instruments for measuring temperature, etc. Measuring Instruments (Pullin) Ltd., Electrin Wks, Winchester St, Acton, W.3.

Newbrematic. 816,462. Class 9. Switchgear, motors, apparatus and instruments, etc. Stanley Newbery Ltd., Daisybank Wks, Lancaster Rd, New Barnet, Herts.

Panostat. 813,058. Class 9. Temperature control devices for hotplates. A.E.I. Ltd., 33 Grosvenor Pl, S.W.1.

Rocksil-K. 817,306. Class 17. Thermal and sound-insulating materials, etc. The Cape Asbestos Co. Ltd., 114 and 116 Park St, W.1.

Wingard in design. B810,402. Class 9. Accumulators, anti-theft warning devices, electric door-openers, foot warmers, fuses and switches, etc., for motor land vehicles. B810,404. Class 12. Windscreen washers, etc. Wingard Ltd., Kingsham Rd, Chichester, Sussex.

ELLIOTT-AUTOMATION LIMITED

SUMMARY OF RESULTS AND POINTS OF INTEREST 1960
(In approximate figures)

GROUP SALES			**£20,000,000**
PROFIT BEFORE TAX			**£1,776,000**
(being 8·9% on Sales and 15·5% on Net Tangible Assets)			
of which Taxation took	46%	£817,000	
Preference Dividends	3%	£49,000	
Ordinary Dividends	24%	£433,000	
Retained in Business	27%	£477,000	
CASH FLOW (Retained Profits plus Depreciation)			**£970,000**
FIXED ASSETS ACQUIRED			**£899,000**
DEPRECIATION			**£493,000**
Earnings before tax per 5s. Ordinary Share			1s. 4½d.
Number of Shareholders			14,000
Number of Employees in United Kingdom			nearly 12,000
Total Factory Floor Area in United Kingdom			1,600,000 sq. ft.

There are over 60 operating Companies and Divisions in the Group.

Copies of the full Report and Accounts can be obtained on application to the Secretary, Century Works, Lewisham, London, S.E.13.

The illustrations show coil winding, and the core and winding assembly of a typical 60 MVA 132/33 kV Hackbridge transformer.

HACKBRIDGE TRANSFORMERS

HACKBRIDGE AND HEWITTIC ELECTRIC CO LTD

HACKBRIDGE AND HEWITTIC ELECTRIC COMPANY LTD

HERSHAM · WALTON-ON-THAMES · SURREY

Telephone: Walton-on-Thames 28833 *Telegrams & Cables: "Electric, Walton-on-Thames"*

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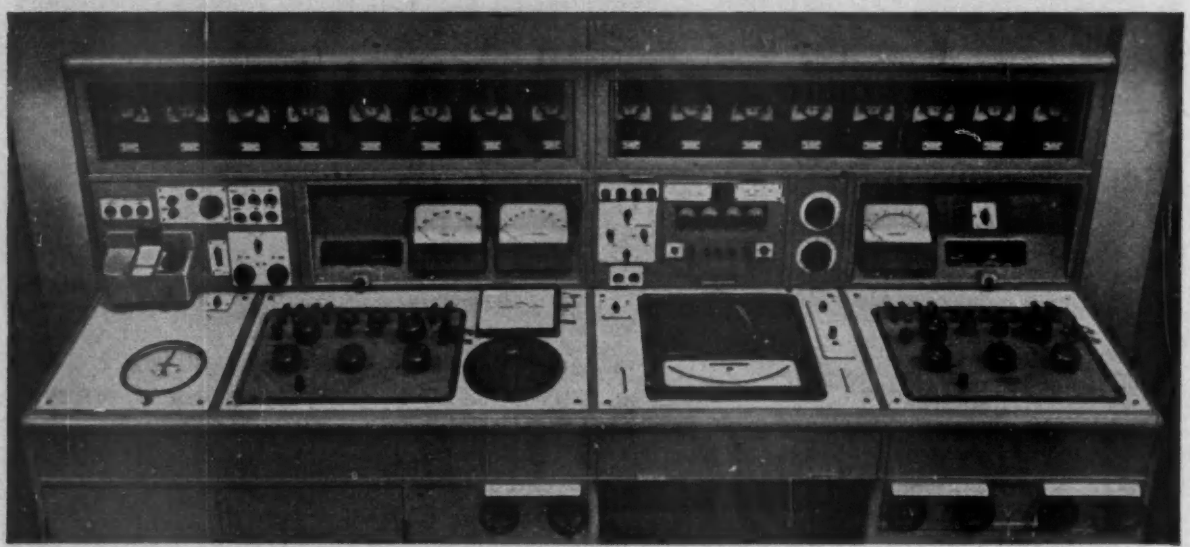
MODEL S 200 STANDARDISATION EQUIPMENT

The Standardisation Bench is the heart of the electronic testing equipment which ensures extreme accuracy of calibration of all S 200 meters. A Laboratory Standard Wattmeter and a crystal controlled electronic timer, reading to 1/10th of 1 millisecond, are used for the daily checking of the Rotating Standard. d.c. potentiometers are installed for the regular checking of the Laboratory Standard Wattmeter.
A large Rotating Standard dial presents the average speed of 4 very closely checked Standard Meters. Separate sets of four Standard meters being maintained for each of the various frequency ranges in which meters are supplied. The Standardisation Bench is used to check the Master Meter in each control unit in the final calibration line.



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CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

CITY OF MANCHESTER · HOUSING COMMITTEE

TENDERS invited (returnable noon, 17 July, 1961) for Electrical Installations to the following:

Contract 349: Handforth, 744 houses and flats.

Particulars and documents from Director of Housing, Town Hall, Manchester 2. (B 278)

COUNTY BOROUGH OF HUDDERSFIELD

Supply of Time Switches for Street Lighting

TENDERS are invited for the supply of 500 Synchronous Motor Plug-in Time Switches in dust-proof cases, 20 amp, S.P. 200/250 volts with solar dials adapted to light and extinguish at times determined by the Huddersfield Corporation.

Forms of Tender and Specifications may be obtained on application, to A. L. Percy, ESQ., M.I.C.E., Borough Engineer and Surveyor, High St Bldgs, Huddersfield.

Sealed tenders, in the envelope provided, must be delivered to the undersigned not later than 10 a.m., on Monday, 10 July, 1961.

The Corporation do not bind themselves to accept the lowest or any tender.

HARRY BANN,
Town Clerk.

Town Hall,
Huddersfield.
June, 1961. (B 250)

CITY OF MANCHESTER · HOUSING COMMITTEE

TENDERS invited (returnable noon, 3 July, 1961) for Electrical Installations to 179 Houses and Maisonnettes. Contract 284, Bradford Rd.

Particulars and documents from Director of Housing, Town Hall, Manchester 2. (B 267)

CITY OF BELFAST

TENDERS are invited for the supply, delivery and erection of:

33 kV AND LOWER VOLTAGE CABLES AND ACCESSORIES

Form of tender and specification number W.195, in duplicate, may be obtained at Electricity Department, East Bridge St, Belfast 1, on payment of a deposit of £2 2s, which amount will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the tender documents may be obtained at £1 1s each, which sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, one copy only, in sealed envelope marked "Tender for 33 kV and Lower Voltage Cables and Accessories—Electricity Committee" and endorsed with the name and address of the tenderer must reach the undersigned not later than 4 p.m., on Friday, 4 Aug., 1961.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast 1.
P.O. Box 234. (B 247)

COUNTY BOROUGH OF WALLASEY

Erection of Flats and Maisonnettes
Union Street
Electrical Installation

TENDERS to reach the undersigned by 12 July, 1961, are invited for the electrical installation to 42 units of accommodation in Union St, Wallasey. Specification and Form of Tender available from the Borough Architect, Town Hall, Wallasey.

A. G. HARRISON,
Town Clerk.
(B 269)

BOROUGH OF ILFORD

Street Lighting Group "B"
District Roads Scheme—Stage IV

TENDERS are invited from experienced Contractors for the following work in connection with this Scheme:

(a) Erection and connection of approximately 1,200 No. columns and lanterns.
(b) Cable laying, jointing and trenching.
(c) Thrust boring.

Conditions of Contract and other documents may be inspected at the office of the Borough Engineer and Surveyor, Town Hall, Ilford, from whom the Specification, Bills of Quantities and Tender Form may be obtained upon payment of £2 2s, which will be refunded on receipt of a bona-fide tender not subsequently withdrawn.

Tenders in the envelope provided, bearing no name or mark indicating the tenderer and endorsed "Tenders for District Roads Lighting Scheme—Stage IV," must be delivered to the Town Clerk, Town Hall, Ilford, not later than 4 p.m., on 25 July, 1961.

The Council do not bind themselves to accept the lowest or any tender. (B 255)

APPOINTMENTS VACANT

SOUTH EASTERN ELECTRICITY BOARD

CARTOGRAPHIC DRAUGHTSMAN
DORKING AND EPSOM DISTRICT

SALARY: £700 x £25—£775 p.a. under Grade 2 of the N.J.C. Agreement. Superannuable. (The grade of this post is likely to be reviewed in favour of Grade 3 in April, 1962.) Applicants should have experience in the preparation of mains record plans, reproduction of Ordnance Survey Maps and general drawing office routine. Applications, quoting ET, on forms from District Manager, Seeboard, 56 South St, Dorking, by 12 July, 1961.

FIRST ASSISTANT DISTRICT ENGINEER
(CONSTRUCTION)
WOKING DISTRICT

Salary: £1,275/£1,410 p.a. under N.J.B. Class G, Grade 5, with progression to Grade 4 (maximum salary £1,500) subject to satisfactory service. Superannuable. This appointment occurs in a rapidly expanding urban and rural district. Applicants, preferably corporate members of the I.E.E., should have considerable experience in electricity distribution work covering the planning, construction, operation and maintenance of H.V. and L.V. systems.

continued in next column

continued from previous column

ASSISTANT DISTRICT ENGINEER
WOKING DISTRICT

Salary: £965/£1,090 p.a. under N.J.B. Class G, Grade 9. Superannuable. This appointment occurs in a rapidly expanding urban and rural district. Applicants of good general education should have had technical training to Higher National Certificate standard with practical experience of general distribution work and be capable of assisting on planning, construction and maintenance work.

Candidates should indicate clearly for which of the above two posts they are applying. Consideration will be given to a private car allowance and in appropriate circumstances to assistance with housing. Applications, quoting ET, on forms from District Manager, Seeboard, 4 Chobham Rd, Woking, by 12 July, 1961.

ASSISTANT DISTRICT ENGINEER
GUILDFORD DISTRICT

Salary: £765/£870 p.a. under N.J.B. Agreement, Class F, Grade 11. Superannuable. Applicants should have minimum qualification of the O.N.C. in electrical engineering and should possess general engineering experience preferably in the electricity supply industry. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances. Applications, quoting ET, on forms from District Manager, Seeboard, Woodbridge Rd, Guildford, by 12 July, 1961.

GEORGE WRAY,
Secretary.
(B 289)

ADMINISTRATIVE COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER
£960/£1,310

CANDIDATES must be Associate Members of the Institution of Electrical Engineers or be in possession of the Higher National Certificate and be experienced in the design of electrical installations for all types of buildings. Removal expenses and lodging allowance may be paid to a married man. Apply on form available from the County Architect, 123 London Rd, Leicester. (B 10)

NEW ZEALAND GOVERNMENT

New Zealand Electricity Department

MEREMERE POWER STATION

APPLICATIONS are invited for the position of:

STATION CHEMIST, MEREMERE

Salary: £1,030/£1,075 or £1,120/£1,165 p.a.

The Meremere Station, which is 40 miles south of Auckland, was commissioned in 1958 and has a capacity of 180 megawatts, comprising six units of 30 megawatts. Boilers are pulverised coal-fired with steam conditions 635 p.s.i. 865°F.

Applicants should have a University or similar qualification and have had laboratory experience in a modern steam power station and be familiar with the associated problems of operation at high pressure and temperature. A recognised qualification for the duties is desired.

Appointee will be required to reside at the nearby departmental power station village. Married accommodation available.

Passages: Steamer fares of up to £172 each for the appointee and his wife, and *pro rata* for dependent children will be paid.

Incidental Expenses: Up to £35 for a single person and £100 for a married man can be claimed to cover the cost of taking personal effects to New Zealand.

Application forms and further details are available from the High Commissioner for New Zealand, 415 Strand, London W.C.2, with whom applications will close on 28 July, 1961.

Please quote reference B.13/7/1 when enquiring. (B 282)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CITY AND COUNTY OF BRISTOL EDUCATION COMMITTEE

Bristol Technical College

DEPARTMENT OF ENGINEERING

APPLICATIONS invited from suitably qualified and experienced persons for Two appointments as

ASSISTANT LECTURERS, GRADE B

in Electrical Engineering.

Applicants should be able to offer a selection of at least two from the following:

Electrotechnology for O.N.C. courses.

Electronics for Electrical Technicians.

Electrotechnology for City and Guilds courses.

Rules and Installation Technology.

Burnham Technical Scale salary (at present under review), £700/£1,150 p.a., with additions for training and graduate or equivalent qualifications; placing on scale dependent on approved industrial and teaching experience.

Application forms, returnable by 10 July, and details from the Registrar, Bristol Technical College, Ashley Down, Bristol 7. Please quote ref. no. BTC 61/27. (B 246)

THE NORTH WESTERN ELECTRICITY BOARD

SENIOR ASSISTANT
(SALES SUPERINTENDENT)
NORTH WEST DISTRICT, ECCLES

APPLICANTS should be experienced in the supervision of Service Centres, organisation of exhibitions, demonstrations and displays. The successful candidate will be responsible for domestic and commercial development and the supervision of staff engaged on that work. Ability to develop business is essential and preference will be given to applicants with technical qualifications.

Salary Scale: £1,150 x £30—£1,240 p.a. Grade 6. N.J.C. Conditions.

FOURTH ASSISTANT ENGINEER
TESTING SECTION
SUB-AREA ENGINEERING DEPARTMENT
MANCHESTER

Applicants should have experience of general testing work with particular reference to protective equipment. The duties will include the supervision of commissioning tests of protective equipment in substations.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering or its equivalent.

Salary Scale: £1,040/£1,165 p.a. Grade M.13. N.J.B. Conditions.

FOURTH ASSISTANT DISTRICT
COMMERCIAL ENGINEER
(TECHNICAL SALES AND SERVICE)
NORTH WEST DISTRICT, ECCLES

Applicants should be capable of assisting the Technical Sales and Service Engineer in connection with industrial and commercial matters. Good technical training essential.

Salary Scale: £765/£870 p.a. Grade H.13. N.J.B. Conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, and returned to him by 10 July, 1961.

SECOND ASSISTANT ENGINEER
SUB-AREA COMMERCIAL DEPARTMENT
PRESTON

The person appointed will be required to exercise general supervision over the installation contracting sections in the Sub-Area and to assist in industrial and commercial load development. Experience in design and the preparation of specifications and plans for all classes of electrical installations and the supervision of staff and manual workers is essential.

Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary Scale: £1,440/£1,610 p.a. Grade L.7. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune St, Preston, and returned to him by 10 July, 1961.

Note: Previous applicants need not re-apply. (B 245)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

VACANCY FOR FIRST ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the post of First Assistant District Engineer in the Lewis District.

The District Office is in Stornoway, where the successful candidate is required to operate.

The District is predominantly rural, embracing the Islands in the Outer Hebrides, and the post provides work of an interesting and varied nature which at times necessitates travel by sea and air.

Applicants should have experience in the Construction, Operation and Maintenance of H.V. and L.V. Overhead and Underground Distribution Networks, Substation Plant and ancillary apparatus.

Minimum technical qualifications: Ordinary National Certificate in Electrcal Engineering.

Superannuation Scheme applicable.

Salary: N.J.B. Class C, Grade 5, £965/£1,090.

Application forms, obtainable from Area Manager, Church St, Dingwall, should be returned completed by 10 July, 1961.

Area Manager.
(B 221)

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT
COMMERCIAL ENGINEER

REQUIRED in the Cannock District of the Wolverhampton Area.

Applicants should have had considerable experience in connection with consumers' service, electrical appliances and installation repairs. Technical qualifications desirable.

Salary: £825/£940 per annum (N.J.B. Grade F.10). Superannuable.

Apply, by letter, within 14 days, stating age, experience, qualifications, present position and salary, to Mr D. Holt, Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

F. W. CATER,
Secretary.
(B 276)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region
North Thames Division

APPLICATIONS are invited for the following appointment in the System Operation Department, Thames North Grid Control Centre, Redbourn, near St. Albans, Herts.

THIRD ASSISTANT ENGINEER
(S.V. No. 1516)

Salary: N.J.B. Class BX, Grade 8, Scale 11, £1,105/£1,410 per annum, plus 10% Shift Allowance.

Applicants who applied as a result of the recent advertisement need not re-apply as they will automatically be reconsidered.

The commencing salary will be within the above range at a point commensurate with qualifications and experience. The minimum technical qualification required is the Higher National Certificate in Electrical Engineering.

Some generating station and/or transmission/technical experience is essential. The successful applicant will be required to undertake shift duties in the Grid Control Room.

Forms of Application (AE.6/ACT) may be obtained from the Board's Headquarters, or from any Divisional Offices of the Board, and should be addressed to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 8 July, 1961, quoting reference S.V. No. 1516. (B 242)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate Vacancy Number.

Northamptonshire Sub-Area

Vacancy No. 71/61.
THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER
KETTERING DISTRICT

Salary: N.J.B. Class G, Grade 9, £965/£1,090 per annum.

The duties will include assisting in the preparation of specifications and estimates for electrical installations, the supervision of electrical contracting work, and advice to consumers on tariffs, electrical installations and apparatus.

Applications should be forwarded to The Manager, Northamptonshire Sub-Area, 25 Bridge St, Northampton, by 14 July, 1961.

Leicester Sub-Area

Vacancy No. 73/61.
DEMONSTRATOR

Salary: N.J.C. Grade 1, £600 x £25—£700 per annum.

Applicants must be over 21 years of age, should hold the E.A.W. Electrical Housecraft Certificate, and should be experienced in general Service Centre duties. They should be capable of conducting demonstrations and advising consumers on the selection and use of electrical appliances both at the Service Centre and on consumers' premises.

Ability to drive a motor vehicle will be an advantage.

Applications should be forwarded to The Manager, Leicester Sub-Area, Charles St, Leicester, in an envelope endorsed "Demonstrator," by 14 July, 1961. (B 260)

THE SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

Swansea and West Central Area

THIRD ASSISTANT ENGINEER
SWANSEA AND WEST CENTRAL AREA
(Located at Pontardulais, nine miles from Swansea)

Appointment to this post will provide a suitable Engineer, preferably possessing the Higher National Certificate or higher professional qualification, with opportunities for acquiring a considerable breadth of experience. Initially the appointment will be to the Substations Section of the Department, but it will be necessary for the person appointed to transfer to a comparable post in the Mains and Planning Sections in turn after a period of time on Substations work.

Salary: N.J.B. Class L, Grade 10, Scale 10, £1,190/£1,325 per annum.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea Industrial Estate, Swansea, to arrive not later than 15 July, 1961.

Please quote reference S.V.81/61/ET, endorsing envelope "Third Assistant Engineer."

Monmouthshire and Mid-Wales Area

ASSISTANT COMMERCIAL ENGINEER
NEWPORT DISTRICT

The duties of this position will be of a general nature and preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

Salary: N.J.B. Class H, Grade 11, Scale 6, £890/£1,105 per annum.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to W. E. Richardson, M.I.E.E., Manager, Mon and Mid-Wales Area, Llywelyn Rd, Cwmbran, to arrive not later than 15 July, 1961.

Please quote reference S.V.82/61/ET, endorsing envelope "Assistant Commercial Engineer."

R. G. WILLIAMS,
Secretary.
(B 279)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (PLANNING)

REQUIRED at No. 1 Sub-Area Headquarters, Liverpool. Salary will be within range £1,040/£1,165 per annum (N.J.B. Class M, Grade 13).

Applicants should have had sound training in all aspects of the distribution of electricity, and have a knowledge of the technical and economic principles underlying the design of distribution systems; the possession of suitable technical qualifications is desirable.

Appointment subject to medical examination. Pension Scheme.

Special application forms, obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, should be returned not later than 14 July, 1961. (B 271)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

South Caledonia Area
Blackfriars, Perth

THIRD ASSISTANT ENGINEER (PLANNING AND TECHNICAL)

GRADE G.9, Salary Scale 7 (£965/£1,090). (The classification will be increased to "H" next year.)

Applicants for the above post should have at least a Higher National Certificate and should preferably have had some district experience.

The duties are mainly planning and protection, but opportunity is also given to gain experience in other departments. Ability to drive is desirable.

Application Forms should be returned within days to the Area Manager. (B 243)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER (2)

REQUIRED in the Liverpool South District of the Board's No. 1 Sub-Area. Salary within range £765/£870 per annum (N.J.B. J/14).

Applicants should have completed a recognised electrical apprenticeship, and some technical training will be an advantage. Duties will include estimating and preparation of specifications for contracting work, and advising consumers on matters relating to Electricity Supply and the utilisation of electrical equipment.

Appointment subject to medical examination. Pension scheme.

Standard application forms, obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, should be returned not later than 14 July, 1961. (B 262)

THE EAST MIDLANDS ELECTRICITY BOARD

SUB-AREA COMMERCIAL OFFICER
DERBY AND BURTON SUB-AREA
Staff Vacancy 69/61.

APPLICATIONS are invited for the post of Sub-Area Commercial Officer in the Derby and Burton Sub-Area, which will become vacant in November, 1961.

Applicants should preferably be Chartered Electrical Engineers.

The person appointed would be directly responsible to the Sub-Area Manager for the co-ordination of the activities of the commercial staff in the Sub-Area and should have had extensive practical experience in industrial commercial, domestic and agricultural development, including the supervision of Service Centres and Contracting Departments.

The salary will be in accordance with Class "B," Grade 5, of the National Joint Managerial and Higher Executives Grades Committee Agreement, commencing at £1,965 per annum, rising by two increments of £75 and one increment of £55 to £2,170 per annum.

Applications stating age, qualifications, experience, present position and salary should be forwarded to the Chief Commercial Officer, Mapperley Hall, Lucknow Ave, Nottingham, in a confidential envelope endorsed "Sub-Area Commercial Officer," to reach him not later than Monday, 31 July, 1961. (B 207)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position as a

THIRD ASSISTANT ENGINEER (SAFETY)

on the staff of the Chief Engineer.

The successful candidate will be responsible to the Board's Safety Engineer and will be concerned with all matters relating to the safety of personnel engaged in Generation, Transmission and Distribution in the Board's District.

Applicants should have a good knowledge of the Factories Acts and Regulations and be experienced in the Electricity Supply Industry. Preference will be given to candidates with qualifications equivalent to Membership of the Institution of Electrical or the Institution of Mechanical Engineers.

Salary: N.J.B., Grade 6—£1,320/£1,610 per annum.

Applications, quoting reference E23/61, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow, S.4, not later than 14 July, 1961. (B 264)

BOROUGH OF ILFORD

Borough Engineer's Department

APPOINTMENT OF CLERK OF WORKS (PUBLIC LIGHTING) GRADE APT. I.

APPLICATIONS are invited for this appointment. Salary: £645/£815 per annum, plus London Weighting. Five-day week. Commencing salary according to qualifications and experience. Candidates should be experienced in all aspects of street lighting installations and be capable of supervising jointing of cables, erection of columns and electrical work.

Appointment superannuable and subject to medical examination. Forms of application obtainable from Borough Engineer, Town Hall, Ilford, and should be returned by 10 July. (B 227)

SOUTH OF SCOTLAND ELECTRICITY BOARD

ASSISTANT PURCHASING OFFICER

APPLICATIONS are invited for the above superannuable position within the Purchasing Department at Board Headquarters.

The duties comprise responsibility for bulk purchase arrangements, supervision and co-ordination of purchases, stocks and stores disposal within the distribution areas; the purchase of supplies for 275 kV and 132 kV transmission system; printing, stationery and other requirements for Board Headquarters. Candidates should have a thorough knowledge of suppliers within the electrical manufacturing industry, and possess experience in the purchasing of plant, equipment and stores for the distribution of electricity.

Salary: N.J.M.C. Class C, Grade 6, £2,380/£2,595 per annum.

Applications, quoting reference number P.1/61, should be submitted on the standard form to the Secretary, Inverlair Ave, Glasgow S.4, not later than 14 July, 1961. (B 241)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 4 Sub-Area

ASSISTANT CONSUMERS' ENGINEER

REQUIRED at Llanrwst. Salary within the range £765/£870 per annum (N.J.B. F.11, Scale 4).

Applicants should have completed a recognised electrical apprenticeship and had some technical training. Duties will include estimating, preparation of specifications and supervision of contracting work, advising consumers on matters relating to electricity supply and the utilisation of electricity. The ability to speak Welsh and to drive would be an advantage.

The work is of an interesting nature and the post is pensionable with good working conditions and reasonable future prospects to suitable staff.

Appointment subject to medical examination.

Application forms obtainable from the Manager, No. 4 Sub-Area, Rhostyllen, near Wrexham.

Closing date: 14 July, 1961. (B 270)

WORCESTERSHIRE EDUCATION COMMITTEE

Redditch College of Further Education

APPLICATIONS are invited from suitably qualified persons to teach mainly Mechanical, and some Electrical Engineering subjects, to at least O.N.C. or O.N.D. level. It would be helpful if the electrical subjects included electronics.

Applicants must have Associate Membership of the relevant Institutions or equivalent qualifications.

Salary: Grade B, £700 x £27 10s (15) and £37 10s—£1,150. Plus Graduate allowance.

Application forms may be obtained from the County Education Officer (TS), County Education Office, Castle St, Worcester, on receipt of stamped addressed foolscap envelope, and should be returned to the Principal immediately. (O.128) (B 265)

THE UNIVERSITY COLLEGE OF SUSSEX

CLERK OF WORKS FOR ENGINEERING SERVICES

APPLICATIONS are invited for the above appointment at a salary in the range of £1,000/£1,300 per annum.

The Clerk of Works will be employed by the University to supervise the installation of Engineering Services in Stage I of an extensive development programme. The services installations include a high pressure hot water boiler house and external and internal distributions for heating and hot and cold water supplies, fire services, gas, compressed air, vacuum, etc., ventilation, electrical and plumbing and drainage works.

The first two buildings of Stage I are now under construction and a further four buildings are proposed. Subject to satisfactory service, there is a possibility of continuity of employment through a prolonged building programme.

Further details may be obtained from T. C. Green, ESQ., B.ARCH., A.R.I.B.A., Buildings Officer, The University of Sussex, Stanmer Hse, Brighton, Sussex.

Applications, giving age, qualifications, experience, present post, salary and names of two referees, should be forwarded to Steenson, Varming and Mulcahy, Consulting Engineers, 146 New Cavendish St, London W.1, by Monday, 17 July, 1961. (B 268)

UGANDA

Ministry of Works

ELECTRICAL ENGINEER

QUALIFICATIONS: Candidates, 30-45 years old, must have a University degree in Electrical Engineering and be A.M.I.E.E., with at least three years' responsible experience with an Area Electricity Board in the United Kingdom or with an electricity supply undertaking after election as an A.M.I.E.E.

Duties: To work under the Chief Electrical Engineer in the general administration of all electrical undertakings including investigation of accidents, inspection and testing of installations and plant, and to advise and design schemes for Government Departments and Institutions, and supervise the execution of such projects.

Terms of Appointment: On contract for one tour of 21-27 months in the first instance with gratuity of 25%.

Emoluments: In Scale £1,554/£2,448 p.a.

Free passages. Generous leave. Quarters available at moderate rents. Free medical attention.

Apply Director of Recruitment, Colonial Office, London S.W.1, quoting BCD 112/9/021/D10, and giving full name, age and brief details of qualifications and experience.

(B 244)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

SENIOR ASSISTANT
(COMMERCIAL—CLERICAL)

REQUIRED in the Consumer Records Section of the Liverpool North District. Salary is within the range £890/£1,010 per annum (N.J.C. Grade 4).

Applicants should have previous employment in the Electricity Supply Industry and have wide experience of handling consumer records and possess qualities of leadership appropriate to a clerical staff in a busy district. Experience in dealing with correspondence and investigation of complaints and problems associated with hire purchase agreements is required.

Special Application Forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, should be returned not later than 14 July, 1961. (B 288)

THE NORTH EASTERN ELECTRICITY BOARD

Tees Sub-Area

APPLICATIONS are invited from suitably qualified engineers for the appointment of First Assistant District Commercial Engineer, Middlesbrough. Applicants should have experience in the utilisation of electrical energy in commercial and domestic premises, a knowledge of installation work and be conversant with tariffs, sales and all aspects of consumers' service.

Salary: Schedule A, Class G, Grade 5, £1,275/£1,410 per annum. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (B 287)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

CROYDON "B" POWER STATION
STATION SHIFT CONTROL ENGINEER
Vacancy No. 178/61.

APPLICANTS should have sound experience of Control Room duties, and should preferably hold at least O.N.C. (Electrical).

Salary: N.J.B. Class J, Grade 10, £1,194/£1,331 10s per annum, including London and Shift Allowances.

Applications, giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, to arrive by 12 July. (B 284)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

DIVISIONAL HEADQUARTERS
KINGSTON

THIRD ASSISTANT ENGINEER
CONSTRUCTION SECTION
ELECTRICAL DEPARTMENT
Vacancy No. 179/61.

REQUIRED to specify in detail equipment required for all types of transmission contracts, supervise the preparation of necessary electrical layout and civil works drawings and schematic diagrams, examination of tenders and conducting technical correspondence with contractors, etc. Candidates must be suitably qualified and experienced, and have a thorough knowledge of contract procedure and conditions.

Commencing salary within the range £1,180/£1,460 per annum, inclusive of London Allowance.

Applications, giving age, details of education, present position, experience, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 12 July. (B 283)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER

REQUIRED at Ocker Hill Power Station, Tipton, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.7, £1,115/£1,245 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Appropriate qualifications desirable.

Apply, quoting Vacancy No. 172/61 MD, on Form AE6 to the Station Superintendent, Ocker Hill Power Station, Bayley's La, Tipton, Staffs, by 10 July, 1961. (B 291)

LONDON ELECTRICITY BOARD

SENIOR SERVICE CENTRE ASSISTANT

APPLICATIONS are invited for the above position in the Board's North Western District. The successful applicant will be based at the Willesden Showroom, 296 Willesden La, N.W.2, but may subsequently be required to undertake duties at any of the Showrooms in the District.

Applicants should have had previous Showroom experience, possess sales ability and be capable of interviewing and advising consumers on hire and hire purchase apparatus, installations and general supply matters. The successful candidate will be required to undertake Cashier duties when necessary, and to take charge of the Showroom in the absence of the Supervisor.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 3, i.e., £780/£880 per annum, plus the appropriate London Area Allowance.

Applications stating age and experience, should be sent to the Manager, North Western District, Lithos Rd, Hampstead, N.W.3, within 14 days of the publication date of this notice. Please quote ref.: PER/V/3294/T. (B 263)

WHETSTONE **'ENGLISH ELECTRIC'** NR. LEICESTER

ATOMIC POWER DIVISION

INVITE APPLICATIONS FOR A VACANCY FOR A

SENIOR ELECTRICAL ENGINEER

who will be required to supervise and contribute to:
(a) Power station auxiliary system design and the specification of transformers, switchgear, cables, etc.
(b) The design of cable installations.
(c) The design of lighting and small power installations.

Professional qualifications and experience in these or allied fields is essential for this appointment.

ELECTRICAL ENGINEERS

Vacancies also exist for an engineer and assistant engineer to work on particular aspects of the above. Minimum qualification of H.N.C. or equivalent is required. Previous experience in one of these fields would be advantageous but is not essential.

Assistance will be given with initial accommodation. Applications (which will be treated in confidence) should give details of past experience, age and qualifications, and be addressed to the Chief Engineer, c/o Dept. G.P.S., English Electric Hse, Strand, London W.C.2, quoting reference ET/1818H.

(B 297)

ASSISTANT PLANT EFFICIENCY ENGINEER

required in the Manchester office of Consulting Engineers. Applicants should be fully conversant with the operation of modern steam-raising plant and be interested in the operation of all other power station equipment. Duties will include the supervision of tests on all types of power station plant with the accent on boiler testing and investigational work in this field. A degree or at least prospective major Institution Corporate Membership is essential, and previous commissioning and thermal efficiency testing experience would be an advantage. Salary will be dependent on age, experience and qualifications. Applicants, who should not exceed 35 years of age, can obtain application forms from: Staff Appointments, Kennedy and Donkin, 813a Wilmslow Rd, Manchester 20. (B 200)

Works Manager

required for a Company manufacturing industrial electronic control equipment. In addition to proved works management ability, candidates must have a strong electronic/mechanical engineering background with considerable experience in batch production. He will be directly responsible to the Managing Director and he will control mechanical and electronic production, the stores and purchasing office.

The position offers considerable prospects for advancement to an experienced electronic engineer with a flair for organising and controlling all aspects of production. Pension scheme. Location S.W. London. Please send full details in confidence to Box 8343, Electrical Times. (B 252)

GLIKSTEN (WEST AFRICA) LTD.,

Carpenters Rd, Stratford, London E.15,

require an

ASSISTANT ENGINEER (ELECTRICAL)

for a permanent and pensionable appointment in Ghana. Candidates should be between 25 and 31 years of age, have served a recognised apprenticeship, preferably in factory electrical maintenance, and have in addition a minimum of three years' practical experience.

They should also possess at least an Ordinary National Certificate (Electrical).

Please write with full particulars to the Personnel Officer. (B 259)

W. H. ALLEN SONS & CO. LTD.

have a vacancy for a

SALES ESTIMATING AND CONTRACTS ENGINEER

in their

ELECTRICAL DEPARTMENT

Candidates should be between 25-35 years old and possess at least an H.N.C. in Electrical Engineering or equivalent. The work will cover proposals involving A.C. and D.C. generators and motors, Switchgear and Control gear for Land and/or Marine applications. Previous experience is desirable but not essential. Salary according to experience and qualifications.

Application forms, etc., can be obtained from:

THE PERSONNEL MANAGER
(Ref. 507/2)
Queens Engineering Works
Bedford (B 253)

ASSISTANT ELECTRICAL TEST ENGINEER

Applications are invited from men aged 23-40 for the above post in our Electrical Test Section concerned with the testing and investigation of High Voltage Bushings and other Insulation Products.

The Test Section is closely associated with developments in the extremely high voltage field of Insulation Products and offers varied work with a high level of interest.

Training and experience in the Electrical Engineering field is necessary and some knowledge of High Voltage Power Supply Equipment would be helpful. A technical qualification to H.N.C. level is desirable but not essential.

The duties of the post entail a 42-hour working week in relation to Works Departments and a good commencing salary and conditions of service are offered.

Applications giving details of age, experience, qualifications and current salary, should be sent to:—

Personnel Manager,
THE MICANITE & INSULATORS CO. LTD.
Empire Works, Blackhorse Lane, Walthamstow, London, E.17
(B 256)

J. & P.

TRANSFORMER DRAUGHTSMEN

Johnson & Phillips Ltd. invite applications to fill vacancies for Draughtsmen for distribution and medium power transformers. Applications stating age, training and experience to:

Employment Manager,
Johnson & Phillips Ltd.,
Victoria Works, Charlton,
London S.E.7.

(B 293)

Ferranti

transformers

have immediate vacancies for

SALES ENGINEERS

in the Sales Office of the Power Transformer Department at Hollinwood, Lancs.

Candidates should possess H.N.C. in Electrical Engineering, and should preferably have had experience of sales contracts work in the electrical industry.

These vacancies offer a high degree of interest and the opportunity to join the foremost British transformer manufacturing Company possessing

- ★ **World wide interests.**
- ★ **A manufacturing capacity of over 5,000,000 kVA per annum.**
- ★ **The most up-to-date design and development facilities.**

Forms of application can be obtained from T. J. Lunt, Staff Manager, Ferranti Limited, Hollinwood, Lancs. Please quote reference TS. (B 257)

J. & P.

TRAINEE SALES ENGINEER

required in Sheffield

Johnson and Phillips Ltd. have a vacancy in their Sheffield Branch for a Trainee Sales Engineer and invite applications from ambitious young men with H.N.C. in electrical engineering. The successful applicant will in due course handle the selling of Capacitors, Switchgear and Transformers.

J. and P. are one of the leading companies in the industry with factories and selling organisations in this country and throughout the Commonwealth.

Applications giving details of training, etc., should be addressed to the Employment Manager, Johnson and Phillips Ltd., Charlton, London S.E.7. (B 300)

BOROUGH OF FINCHLEY

APPOINTMENT OF ELECTRICIAN

APPLICATIONS are invited from those suitably experienced for the position of Electrician on the staff of the Public Lighting Section of the Council at the Central Depot, Squires La, N.3, at a present wage of £13 14s 9d for a five-day week of 42 hours.

Applications in writing, addressed to the Borough Engineer and Surveyor, 294-6 Regents Park Rd, Finchley, N.3, must be received by not later than Monday, 10 July, 1961. (B 301)

CENTRAL ELECTRICITY GENERATING BOARD

ASSISTANT ENGINEERS (SWITCHGEAR) TRANSMISSION DEPARTMENT

Applications are invited for appointments as Assistant Engineers in the Plant Design Section of the Transmission Department at Headquarters, London S.E.1.

The Section comprises a number of specialist engineers concerned with the main types of Transmission equipment for service voltages up to 400 kV. Their duties include the preparation of general specifications and standards, promotion and evaluation of new developments and designs for general application, their type testing and approval, and the technical assessment of tenders. The application to this work of operational experience and faults is given particular emphasis.

Applicants should have a University degree or Higher National Certificate, or equivalent qualifications leading to Corporate Membership of the I.E.E.

Experience is required in one or more of the following:—

(i) Preparation of switchgear specifications and technical assessment of tenders, with knowledge of current switchgear standards.
(ii) Design, development and testing of circuit-breakers and ancillary apparatus.
(iii) Layout of E.H.V. Substations and the design calculations involved.
(iv) Familiarity with design features and performance of the older types of switchgear.

Salaries within the range £1,280/£2,010 per annum according to duties and responsibilities.

Applications stating age, qualifications, experience, present position and salary to the Appointments Officer, 24/30 Holborn, London E.C.1, by 11 July. Quote "Ref.: ET/293." (B292)

YORKSHIRE ELECTRICITY BOARD

Head Office

CHIEF DRAUGHTSMAN

APPLICATIONS are invited for the position of Chief Draughtsman at the Board's Head Office.

The successful applicant will be required to take charge of the Head Office Drawing Office, which includes Electrical, Civil Engineering, Building and Cartographic Draughtsmen, and to maintain liaison with the Sub-Area Drawing Offices.

Applicants must have a sound knowledge of modern drawing office practices and organisation; previous experience in the Electricity Supply Industry is desirable but not essential.

Salary within the range £1,415/£1,720 per annum (N.J.B. Class BX, Grade 5 transitional to Scale 14), the commencing salary being dependent upon qualifications and experience.

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 17 July, 1961.

No. 1 (Bradford) Sub-Area

THIRD ASSISTANT ENGINEER (DISTRIBUTION DESIGN)

Applicants should possess technical qualifications equivalent to those for Corporate Membership of the Institution of Electrical Engineers and have experience in planning, design and estimating of medium and high voltage overhead and underground distribution systems. Experience in the construction and maintenance of such systems would be an advantage.

Salary: N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

GENERAL ASSISTANT ENGINEER (DRAUGHTSMAN CIVIL AND BUILDING)

Applicants should have had a good general education. The duties of the post will include the preparation, under regular supervision, of final or working drawings in respect of substations, offices, building alterations, etc. Candidates should preferably have had Drawing Office experience in the preparation of such drawings.

This post is based at present at Dockfield Wks, Shipley.

This advertisement cancels the one for Fourth Assistant Engineer (Draughtsman Civil and Building) which appeared last week.

Salary: N.J.B. Class L, Grade 16 (Scale 4), £765/£870 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford 1, not later than 14 July, 1961. (B 294)

BRUSH

BRUSH ELECTRICAL ENGINEERING COMPANY LTD.

(A member of the Hawker Siddeley Group)

We have a vacancy for a

SWITCHGEAR ERECTOR CABLE JOINTER

on our Outside Erection Staff. Applicants must have good experience of jointing cables up to 33 kV and should be prepared to assist on outside switchgear erection. The working area covers the British Isles and applicants must have a clean current driving licence.

Applications should be sent to:

MR. A. GARNER, BRUSH ELECTRICAL ENGINEERING CO. LTD., Loughborough, Leics.

Quoting Reference: PL.9954. (B 298)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointment. Applicants should state age, qualifications, experience, etc., and quote the Vacancy Number.

Derby and Burton Sub-Area:

SENIOR SALES REPRESENTATIVE BURTON DISTRICT

Vacancy No. 77/61.

Salary: N.J.C. Grade 2, £700 x £25—£775 per annum.

The successful candidate will be required to assist in giving advice to Domestic, Commercial and Industrial Consumers on tariffs and the use of electricity for general purposes, including cooking, water heating and space heating, liaison with local authorities, architects and builders of new housing estates, and in carrying out sales of appliances, service centre and general commercial duties. Applicants should have a knowledge of electrical appliances and modern heating practice, and should preferably be able to drive a motor vehicle.

Possession of the E.D.A. Salesmanship Diploma will be an advantage.

Applications should be forwarded to the Manager, Derby and Burton Sub-Area, Electricity Offices, Irongate, Derby, in a confidential envelope endorsed "Senior Sales Representative," by 14 July, 1961. (B 280)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 4 Sub-Area

FIRST ASSISTANT DISTRICT ENGINEER

REQUIRED in the Aberystwyth District of the Board's No. 4 Sub-Area.

Salary within the range £1,115/£1,245 per annum (N.J.B.E. 5—Scale 9).

Applicants should be experienced in the design, construction and operation of overhead and underground distribution systems, and have a knowledge of the technical and economic factors of system layout and design. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham.

Closing date: 10 July, 1961. (B 261)

SOUTHERN ELECTRICITY BOARD

FIELD ENGINEER

CONSTRUCTION Section, Engineering Department of No. 2 (Newbury) Sub-Area, located at Henley (East Sub-Section). Salary: N.J.B. Class M, Grade 13 (£1,040/£1,165 per annum). N.J.B. conditions of service.

The successful applicant will be required to supervise the construction of H.V. and L.V. overhead and underground mains, and the erection of substation equipment. Applicants should possess suitable technical qualifications.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1370, not later than July 10, 1961. (B 290)

BIC (SUBMARINE CABLES) LTD.

require a

CABLE DESIGN ENGINEER

aged 25/35 years, having an electrical engineering degree, H.N.C. or equivalent qualifications, to undertake electrical cable designs and specifications, and preparation of technical data for tenders for Submarine Cable Schemes.

Staff Pension Scheme. Canteen and Social Club facilities.

Applications should be addressed to the Secretary, BIC (Submarine Cables) Ltd., Trafford Park, Manchester 17. (B 254)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

SENIOR CIVIL ENGINEERING AND BUILDING DRAUGHTSMAN
FOURTH ASSISTANT ENGINEER
DRAWING OFFICE
DIVISIONAL HEADQUARTERS
Vacancy No. 148/61.

APPLICATIONS are invited for the position of Senior Civil Engineering and Building Draughtsman (Fourth Assistant Engineer) in the Drawing Office at this Divisional Headquarters.

Applicants for this appointment should be experienced and qualified draughtsmen, fully conversant with the design and detailing of civil and building works, including R.C. structures and foundations. A knowledge of structural steelwork will be an advantage.

The work is associated with H.V. Substations and Generating Stations.

Salary will be in accordance with Class BX, Grade 9 (£1,005/£1,325 per annum), of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 15 July, 1961.

CIVIL ENGINEERING AND BUILDING DRAUGHTSMAN
FOURTH ASSISTANT ENGINEER
DRAWING OFFICE
DIVISIONAL HEADQUARTERS
Vacancy No. 149/61.

Applications are invited for the position of Civil Engineering and Building Draughtsman (Fourth Assistant Engineer) in the Drawing Office at this Divisional Headquarters.

Applicants for this appointment should be Draughtsmen—experienced on the design and detailing of civil and building works, including R.C. structures and foundations.

The work is associated with H.V. Substations and Generating Stations.

Salary will be in accordance with Class BX, Grade 11 (£855/£1,165 per annum), of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 15 July, 1961.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Administrative Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham.

ASSISTANT SHIFT CHARGE ENGINEER
LINCOLN POWER STATION
Vacancy No. 154/61.

Applications are invited for the position of Assistant Shift Charge Engineer at Lincoln Power Station, Spa Rd, Lincoln.

Applicants should have had a sound technical training and experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class F, Grade 9 (£890/£1,015 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 15 July, 1961.

ASSISTANT PLANNING ENGINEER
WILLINGTON "A" AND "B" POWER STATIONS
Vacancy No. 151/61.

Applications are invited for the position of Assistant Planning Engineer at Willington "A" and "B" Power Stations, P.O. Box No. 27, Derby.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 15 July, 1961.

These appointments will be pensionable within the terms and conditions of the

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Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller.
(B 281)

Eastern Electricity

Chilterns Sub-Area

SUB-AREA HEADQUARTERS
FOURTH ASSISTANT ENGINEERS
OPERATION AND MAINTENANCE SECTION

THE duties of the section include the supervision of the repair and maintenance of 33 kV substation plant and equipment, underground cables and overhead lines by direct and contract labour; assisting in the commissioning of substations up to 33 kV, including protection equipment and ancillary apparatus; pressure testing; fault location; and the operation of the System Control Centre.

Salary for these appointments: N.J.B. Class M, Grade 12 (2 vacancies). £1,115/£1,245. N.J.B. Class M, Grade 13 (1 vacancy) £1,040/£1,165.

Apply by letter to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend St, Bedford, by 14 July, 1961.

LUTON DISTRICT
GENERAL ASSISTANT ENGINEERS
151/61.N.

Candidates should have had a sound general and technical education. Some experience in H.V. and L.V. distribution systems is desirable.

Salary: N.J.B. Class J, Grade 15 (£715/£805).

Apply by letter to the Manager, Luton District, Eastern Electricity Board, 487 Dunstable Rd, Luton, by 14 July, 1961.

Northmet Sub-Area

SUB-AREA HEADQUARTERS
THIRD ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)
SUB-AREA ENGINEER'S DEPARTMENT
(Ref. 1069) 148/61.R.

Candidates should be suitably qualified and have had wide experience in the operation and maintenance of a large distribution system up to and including 33 kV. They should be capable of programming and controlling maintenance work, supervising all maintenance, commissioning and testing of protective gear and supervisory equipment, and should be conversant with telephone and radio communications.

Salary: N.J.B. Class N, Grade 10 (£1,350/£1,500) plus London Allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Cannon Hill, Southgate, London N.14, by 14 July, 1961.

ENFIELD DISTRICT
THIRD ASSISTANT ENGINEER
(Ref. 1070)

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class H, Grade 9 (£1,040/£1,165) plus London Allowance.

Apply by letter to A. T. Durbridge, Manager, Eastern Electricity Board, 40 Church St, Enfield, Middlesex, by 14 July, 1961.

ST. ALBANS DISTRICT
THIRD ASSISTANT ENGINEER
(Ref. 1052) 149/61.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class H, Grade 9 (£1,040/£1,165).

Apply by letter to F. J. Drake, ASSOCIATE I.E.E., Manager, Eastern Electricity Board, 107 St. Peter's St, St. Albans, Herts, by 14 July, 1961. (B 285)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 213/ET/61.

APPLICATIONS invited for the superannuable N.J.B. appointment of
ASSISTANT MAINTENANCE ENGINEER
(MECHANICAL)
at Uskmouth "B" Power Station, West Nash, near Newport, Mon.

Salary: Schedule A, Class K, Grade 8, Scale 11, £1,275/£1,410 per annum.

Applicants should possess H.N.C. or equivalent qualifications and have had experience in a modern power station.

Special application forms obtainable from Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 12 July, 1961. (B 299)

ASSISTANT ELECTRICAL ENGINEERS with at least H.N.C. and two to three years' experience of E.H.V. transmission work required by Consulting Engineers in their Contracts and Design Department, Weybridge. Applications stating age, qualifications, experience and salary required to Kennedy and Donkin, 12 Caxton St, London S.W.1, quoting ref.: RWMc. (B 277)

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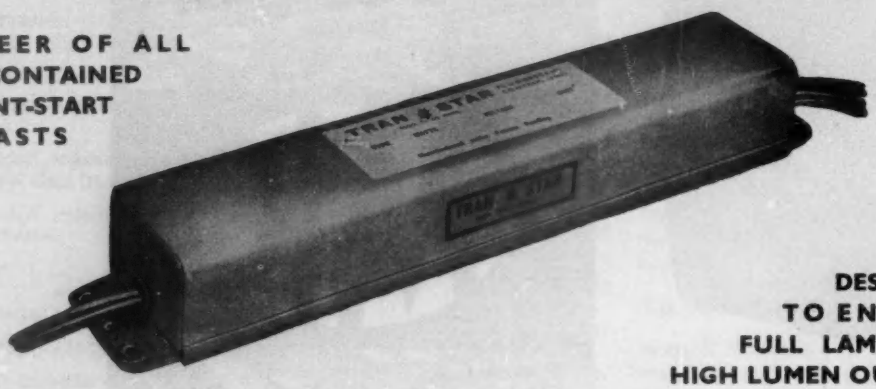

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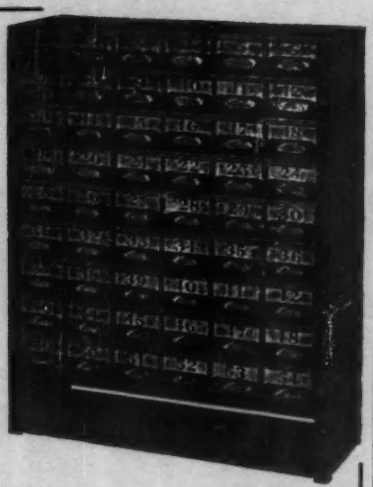

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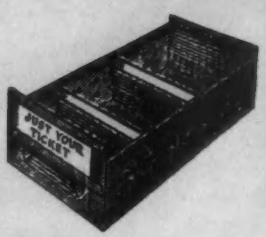

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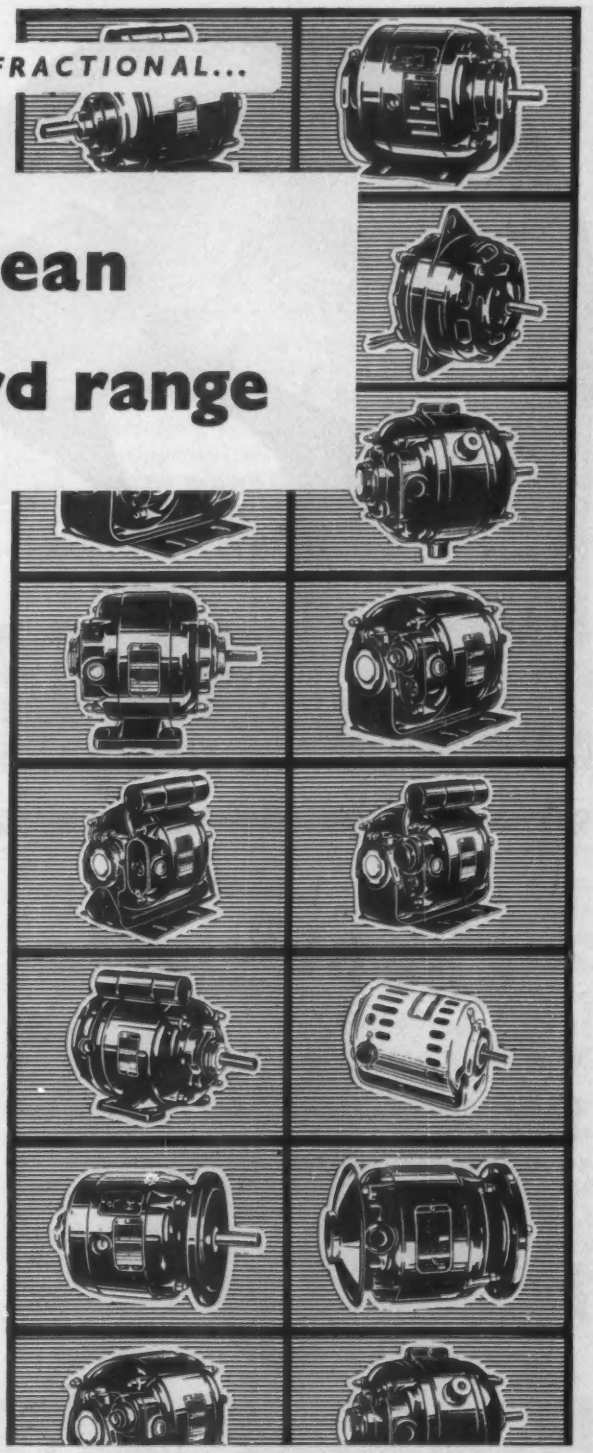

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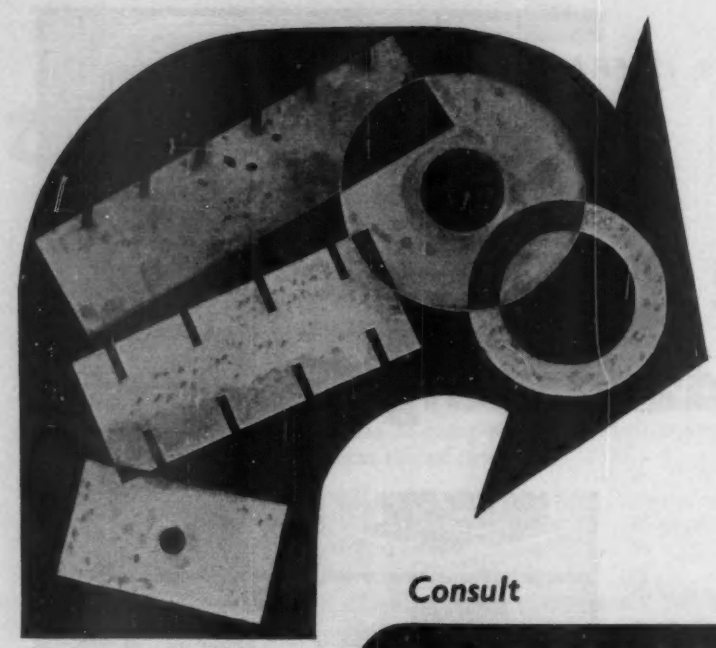

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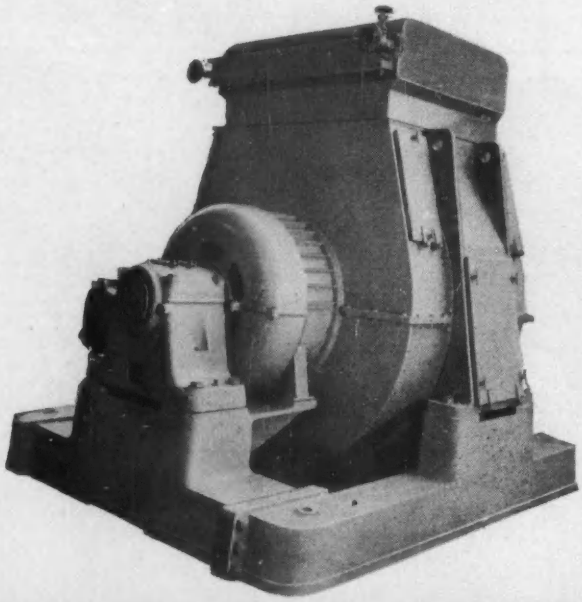

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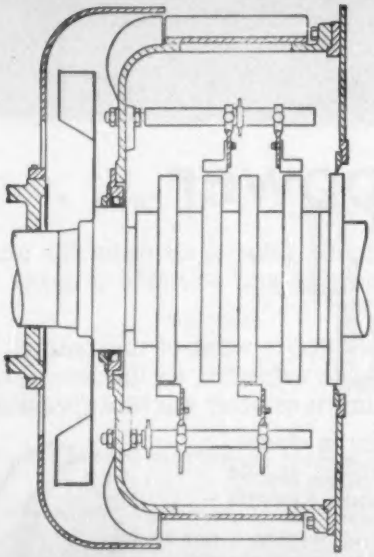

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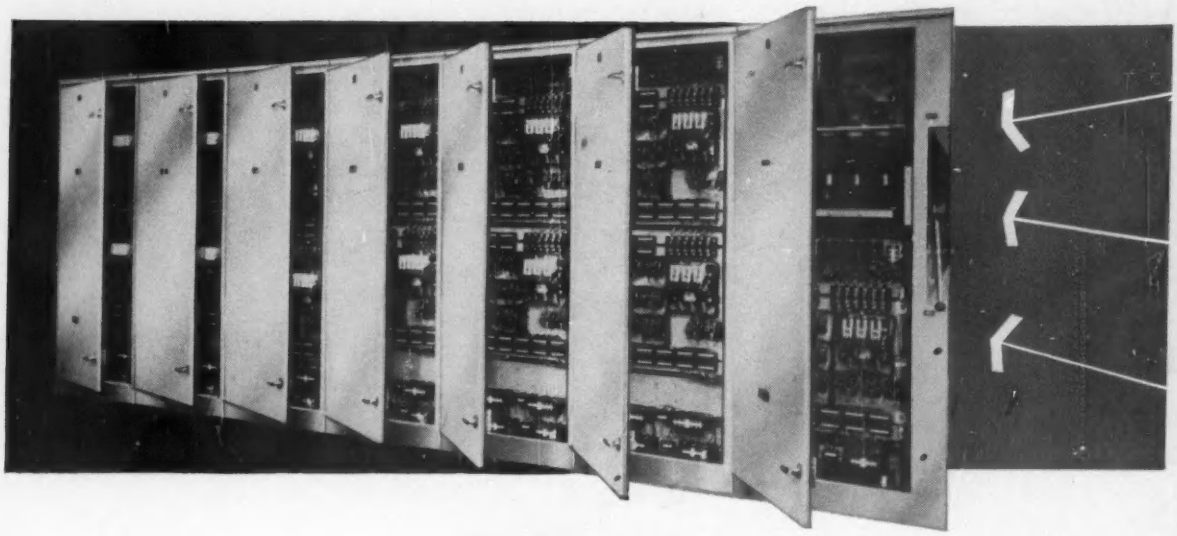

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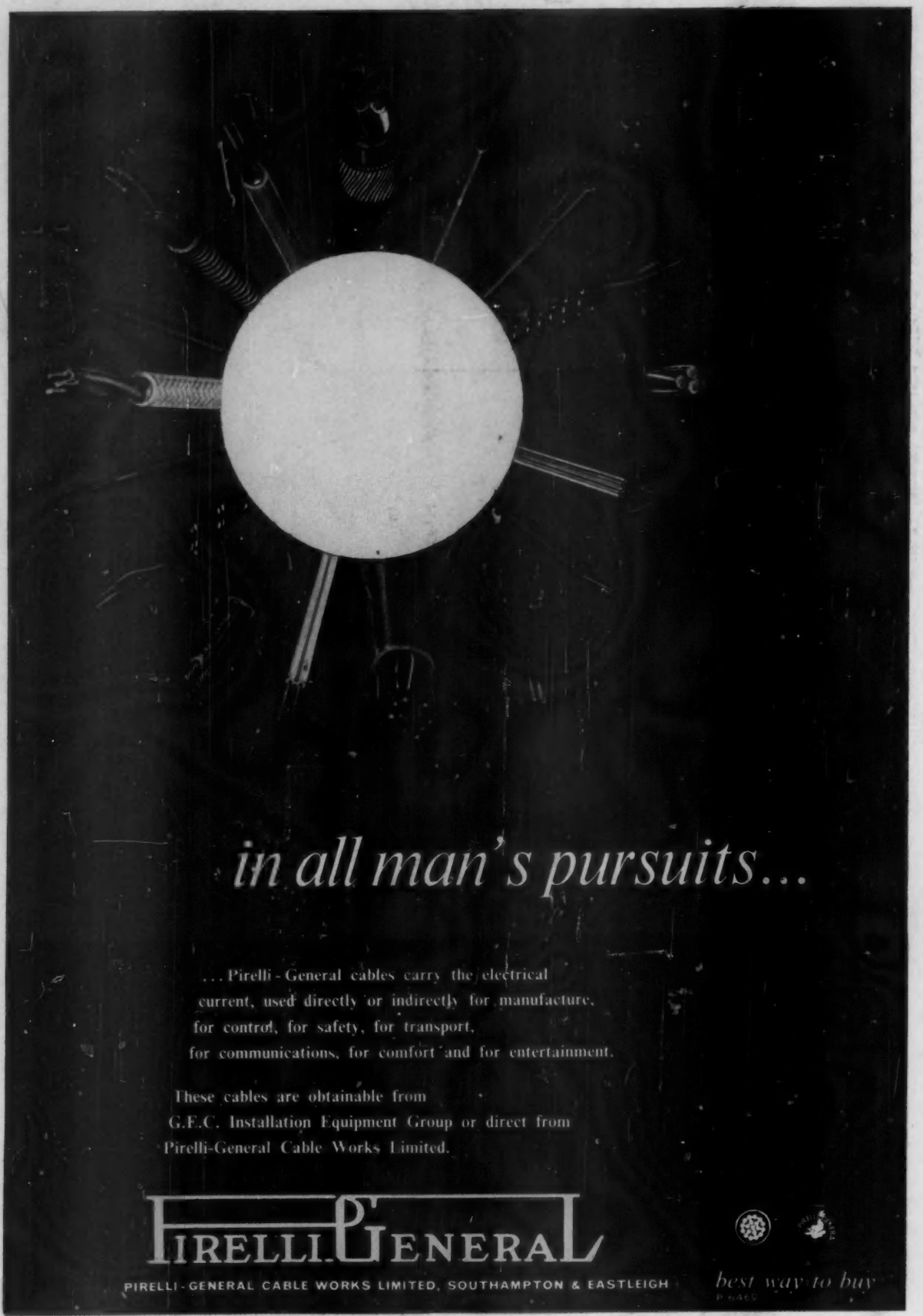
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